Pipe Line Number

The OIL AND GAS JOURNAL

40

DUCING

INING

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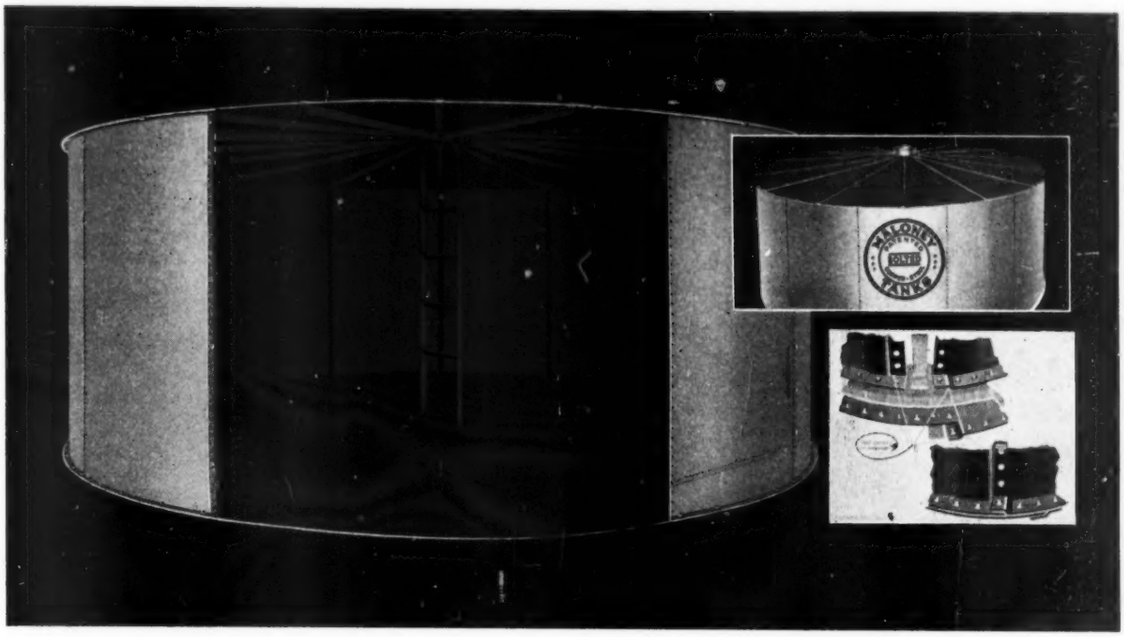
SOLINE

ELINE

KETING



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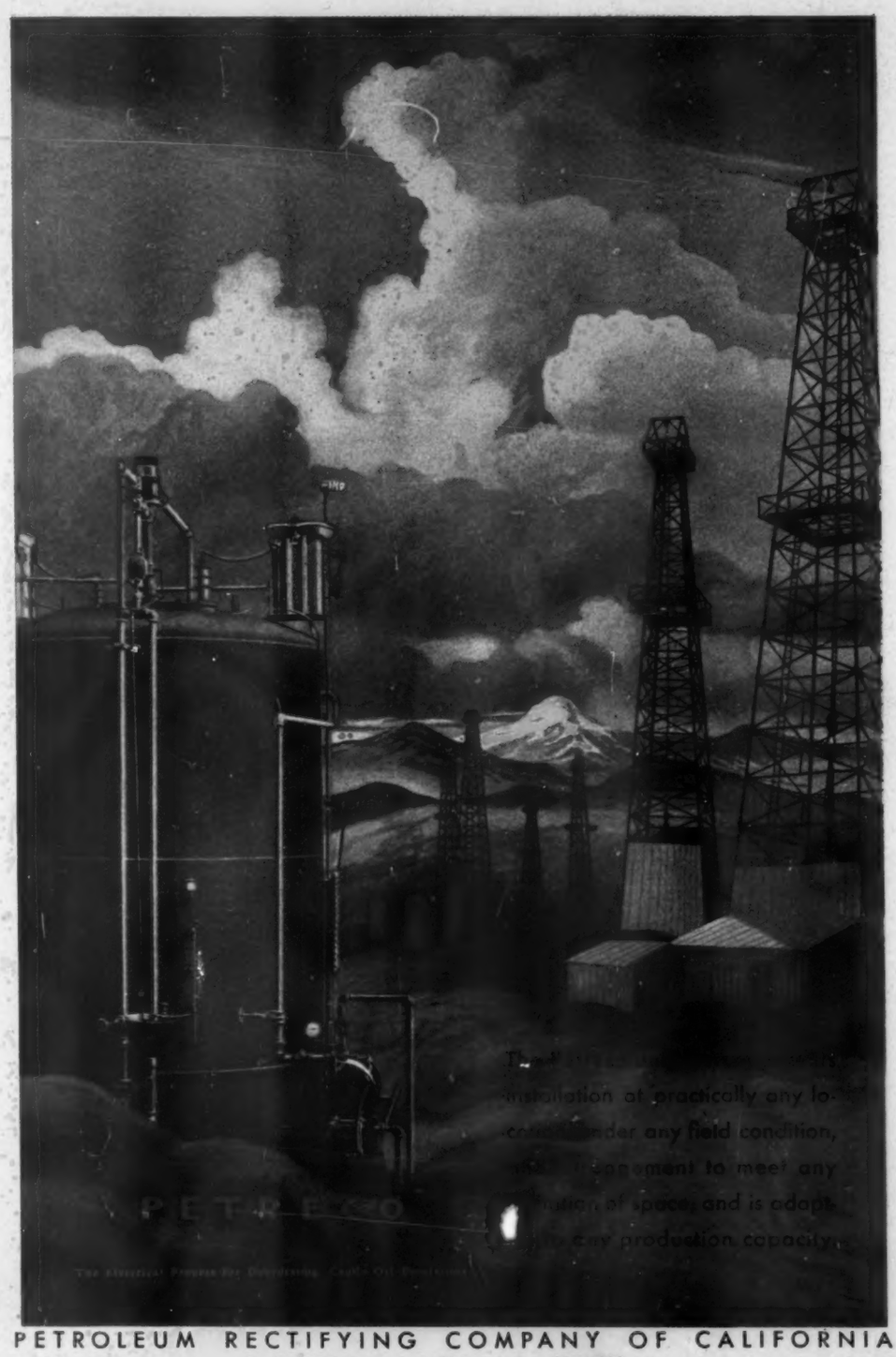

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Branches & Service Men In Principle Oil Fields

THE OIL AND GAS JOURNAL

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SPECIAL ARTICLES

Summary of Situation ---- 7
By ANDREW M. ROWLEY

Federal Tender Board Set Up ---- 8
By HUGH D. MALLON

Horween Urges Buying Plan ---- 8

Price Fixing Talk Revived ---- 8

"None So Blind - - -" (Cartoon) ---- 9

West Tuleta Development ---- 10
By NEIL WILLIAMS

Marland Phones President ---- 10

Repressuring Venango Sands ---- 11
By R. C. CONINE

Iraq Crude Distillation ---- 12
By C. O. WILLSON

Administrator's Report on Stocks ---- 12

Federal Board Starts at Kilgore ---- 14
By L. E. BREDBERG

New York Takes up Oil Exchange ---- 14

Colloidal Properties of Clay ---- 16
By W. K. LEWIS, L. SQUIRES and W. I. THOMPSON

Traveling in Circles (Editorial) ---- 20

Deserves Re-election (Editorial) ---- 20

Atlas Cuts Crude ---- 26

Field Problems From Readers ---- 166
Edited by T. F. SMILEY

PIPE LINE SECTION

Map of Oil, Gasoline and Natural Gas Trunk Lines in the U. S. (insert)

Progress in Pipe Line Operation ---- 36
By WILLIAM G. HELTZEL

Handling Oil at Gulf Terminals ---- 49

Electric Motors Engage Attention ---- 60
By G. R. PROUT

California Company Starts Line ---- 65

Care and Operation of Diesel Engines 68

Corrosion Problems ---- 74
By GORDON N. SCOTT

Iraq Line Completed This Week ---- 82
By C. O. WILLSON

Welding Development ---- 90
By ALBERT N. HORNE

Reconditioning Pipe Lines ---- 97
By E. C. ROLFS

Natural Gas Extensions ---- 101
By ANDREW M. ROWLEY

Gasoline Pipe Lines ---- 105

Oil and Gasoline Pipe Line Personnel 115

Natural Gas Line Personnel ---- 125

FIELD OPERATIONS

Late Fields ---- 28

West and North Texas ---- 29

East Texas ---- 30

Southwest Texas ---- 32

Eastern Fields ---- 146

Gulf Coast ---- 147-148

Kansas ---- 150

N. Louisiana-Arkansas, Mississippi ---- 152

Michigan ---- 153

Central West ---- 153

Canada ---- 155

California ---- 156

Oklahoma ---- 159

Rocky Mountain Area ---- 162

REFINING AND MARKETING

Group 3 Market ---- 22
By T. F. SMILEY

New York Market ---- 23
By C. O. WILLSON

A.P.I. Refinery Report ---- 23

Refinery and Crude Oil Prices ---- 24-25

Tank Wagon Markets ---- 26

News for Petroleum Refiners ---- 145

Technical Questions Answered ---- 165

Chicago Market ---- 174
By C. K. FRANCIS, Ph.D.

GENERAL DEPARTMENTS

Natural Gas Developments ---- 167

Do You Remember? ---- 168

Personal Paragraphs ---- 168-169

Classified Advertising ---- 174-175

Index to Advertisers ---- 176

OIL MAN'S CALENDAR

October

24-25—Indiana Independent Petroleum Association, Inc., first convention, Hotel Severin, Indianapolis, Ind.

29—American Gas Association Convention and Exhibition, Atlantic City, N. J.

November

8-9—Los Angeles, Calif., American Association of Petroleum Geologists, Pacific Section, Mayfair Hotel.

12-15—Dallas, Tex., annual meeting, American Petroleum Institute.

15-17—American Institute of Chemical Engineers, Pittsburgh, Pa.

22-23—Fourth Annual National Road Oil Congress, Tulsa.

December

7-8—Fifth annual meeting, Independent Petroleum Association of America, Fort Worth, Tex.

19-21—Nebraska Petroleum Marketers, Inc., Omaha, Neb.

January

7—New York, Society of Automotive Engineers, annual dinner.

8-10—Milwaukee, Wis., annual convention and Equipment Show of Wisconsin Petroleum Association, Plankinton Hotel.

17-18—Northwest Petroleum Assn., Minnesota Division, West Hotel, Minneapolis, Minn.

March

21-23—American Association of Petroleum Geologists, Annual Meeting, Wichita, Kans.

April

8-13—Oil Equipment and Engineering Exposition, Houston, Tex.

Refinery Section Starts on Page 22

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Industry Not Optimistic on Success of the Latest Intensive Activity to Stop Hot Oil Output

By ANDREW M. ROWLEY

THE crude price situation with imminent threat of drastic reductions in posted schedules overshadowed all developments in the petroleum industry during the past week. Federal authorities spurred, possibly, by fear of the psychological effect upon the country of a reduction in prices in the leading industry of the nation, marshalled airplanes in Washington and sent a corps of men to East Texas. Texas authorities, facing loss of revenue to the state in form of lessened taxes, appealed to Texas senators in Washington and urged that the seriousness of the matter be placed before the President.

Oil men, fully conversant with the seriousness of the situation for months, were mildly amused at the sudden activity on the part of those charged with enforcement in East Texas and the prosecution of violators of rules and regulations which have been issued. Few in the industry expect any tangible results from the latest gestures. The impression long held by many that Federal authorities are reluctant to test the constitutionality of rules and regulations which have been issued by the Petroleum Administrative Board, is gaining many adherents. It is believed the administration at Washington may feel questions involved might affect the entire N.R.A. Statements have been made by oil men that they believe if there were a show down and the Federal authorities were forced to decide upon a course which would necessitate a decision by a high Federal Court on constitutionality of the N.R.A., the authorities would rather risk having "hot" oil production in East Texas.

Losses being suffered by refiners throughout the country apparently did not become important until revenues of the State and administration prestige were threatened.

Despite the fact few oil men believe the latest activities will stop "hot" oil production many feel there is a good chance of the industry avoiding drastic crude oil price reductions and, if price cuts are made, the lower quotations will not continue for any great length of time. They point to the fact that while there has been greater activity in many fields and promising areas, no discovery of major importance has been made and the industry still is drawing upon its crude oil reserves at an enormous rate.

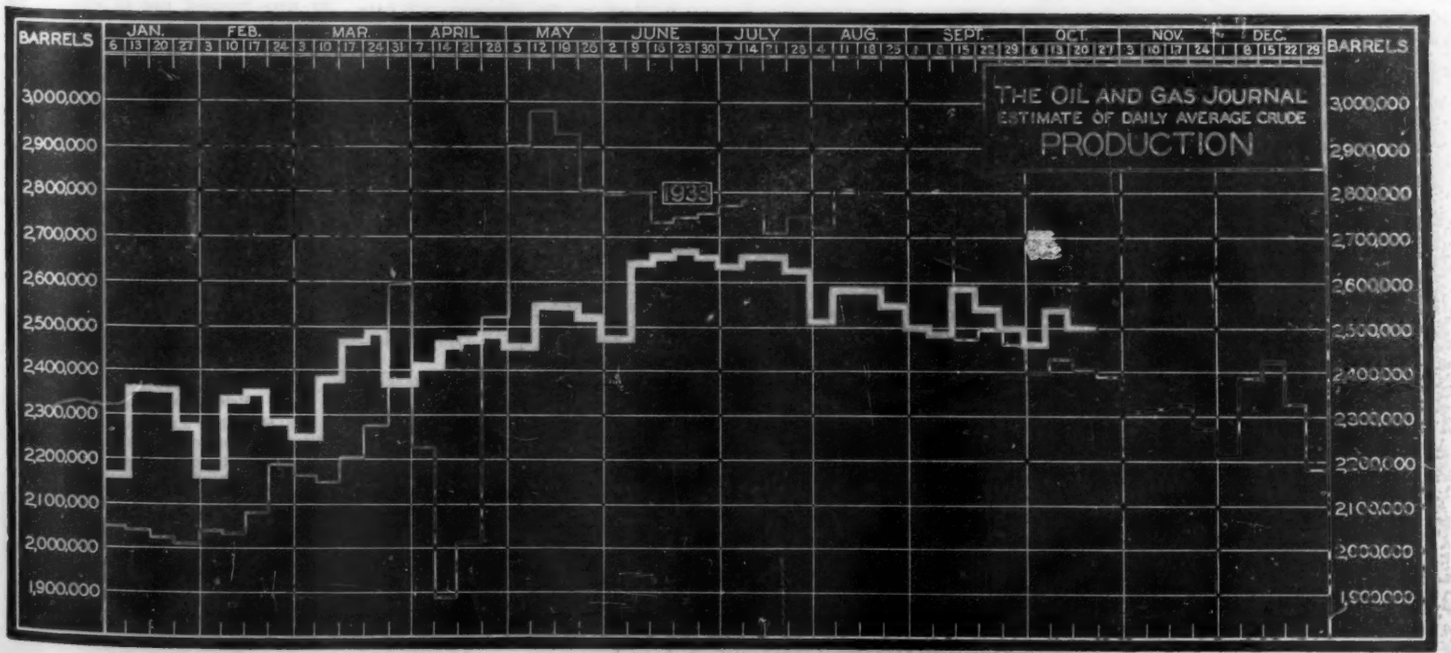
Developments in the different fields during the past week savored much of the routine although the intensive search for new reserves is continuing at a level indicating that companies feel the urgent need of building up their crude oil reserves. Activities on the part of producing companies in developing acreage and purchasing producing properties show clearly present unsatisfactory conditions are not due to "too much crude" but to too low a price for gasoline.

Crude Oil Production in the United States

Estimated daily average production for the week ending October 20, and a comparison with previous week and the Federal allowables follow:

	Oct. 20	Federal allowable in October	Oct. 13
Oklahoma—			
Oklahoma City	158,950	.....	184,805
Seminole-St. Louis	93,425	.....	93,850
Remainder of State	228,000	.....	234,550
Total Oklahoma	480,375	457,400	513,205
East Texas—			
Lathrop	198,997	.....	198,740
Kilgore	188,522	.....	180,120
Joiner	146,234	.....	151,795
Total East Texas	533,753	.....	530,655
West Texas	139,073	.....	138,773
North Central Texas	84,776	.....	85,048
Texas Panhandle	54,774	.....	53,425
East Central Texas	42,625	.....	44,127
Gulf Coast—Texas	167,573	.....	163,025
Southwest Texas	59,527	.....	57,524
Total State of Texas	1,082,101	956,100	1,072,577
Kansas	123,650	123,700	120,575
North Louisiana	23,880	.....	23,735
Gulf Coast—Louisiana	71,875	.....	76,326
Total Louisiana	95,755	88,300	100,061
Arkansas	30,685	30,200	30,645
Eastern Fields (except Michigan)	103,000	97,300	103,000
Michigan	29,277	29,000	30,801
Rocky Mountain area	94,800	91,500	95,960
California—			
Santa Fe Springs	37,000	.....	37,500
Long Beach	62,000	.....	66,750
Mountain View	10,450	.....	7,000
Elwood	9,250	.....	10,000
Kettleman Hills	56,300	.....	60,750
Remainder of State	297,000	.....	300,000
Total California	472,000	452,300	482,000
Total United States	2,511,643	2,325,800	2,548,824

Decrease 37,181 Bbls. Daily.



Federal Tender Board Is Set Up; Department of Justice Slow to Act; Price Fixing Again Being Considered

By HUGH D. MALLON
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Oct. 22.—With the appointment of a Federal Tender Committee by Administrator Ickes, the way is cleared to control the interstate shipment of crude oil and its products, regardless of whether the Department of Justice finally gets around to prosecuting violators. In the meantime a very critical point has been reached in maintaining the posted price for crude, but it is expected any cut will be delayed a few days to await results from the tender board.

Beginning on October 23 no shipments in interstate, or foreign commerce of crude petroleum, or the products thereof, will be allowed, unless such shipments are accompanied by a federal tender showing the petroleum or its products have been legally produced.

Besides it being illegal for any person to ship, or cause to be shipped, oil or its products, without first obtaining the specified tender, it is unlawful for any transporting agency to receive a shipment unless such shipment is accompanied by the necessary federal tender.

Setting up of this board, to consist of not more than three persons, it is believed by many in official capacities here, will be of immeasurable assistance in checking "hot" oil violators, as it will, if properly administered, effectively close all markets outside of the state.

The order establishing this board specifies that tenders must not only be obtained for shipments originating in East Texas destined for an interstate market, but if East Texas oil is shipped to other points within the state notation must be made upon the shipping papers that such oil was produced in the East Texas Field, and that such petroleum or products may not subsequently be shipped in interstate commerce unless a federal tender is first approved by the tender board. The notation as to the origin of the oil must appear on the shipping papers covering all subsequent shipments after leaving the East Texas Fields.

Opinion here is the effect of this action will be felt much quicker than would be possible even with wholesale prosecutions and injunctions by the Department of Justice.

The Tender Board's action will cover more territory than it would be physically possible to take in by court action, as no shipment in interstate or foreign commerce from the East Texas Field can be made legally without first obtaining from the board the certificate that the shipment has been produced, refined or processed in accordance with the law.

Setting up of this committee is not meant as a stop-gap, nor as a temporary expedient to tide the administration over a few rough spots. It is to be a permanent adjunct to the enforcement of the code.

Wait for Justice Department

While the Petroleum Administration has been working out the details of this order, it has been anxiously waiting for some action by the Department of Justice. L. R. Martineau, appointed a special assistant to the Attorney General and given extremely broad discretionary powers to use in enforcing the law in East Texas, left Washington today with several cases to be presented to the courts. He has been severely criticized for delaying so long in proceeding to the field and actively prosecuting his enforcement campaign.

A great deal of confidence in the ability of the Department of Justice officials to cope with the situation has been lost since the efforts of these officials to prohibit the unloading of two tankers at Trenton, N. J., was defeated. These cases were dismissed because of insufficient evidence. Such evidence as the Department of Justice had was prepared by it, and the suits were filed by the department without asking the assistance of the Petroleum Administration. The opinion of an official of the Petroleum Administration, given several days prior to the decision of the court, was that the evidence in the hands of the department would not sustain the cause of action, but, apparently, no effort was made by the Department of Justice to procure more or better evidence. It has been stated sufficient evidence could have been obtained to have prohibited the landing of the cargoes.

What success Mr. Martineau will have in East Texas is questionable. Using the Trenton cases as an example, it might be assumed he will do very little good there, but on the other hand, he has been very busily at work preparing the groundwork for a vigorous program when he arrives in East Texas.

He will be joined in the field by practically every executive in the Petroleum Administrative Board. Charles Fahy, vice chairmen of the board, has been in East Texas for three weeks. Ralph Horween, executive assistant to Administrator Ickes, flew to the field last Thursday. Norman L. Meyers, executive secretary of the board, left Washington by plane Saturday morning, and was followed in the afternoon by Don J. Kirkley, co-ordinator for the board.

For weeks the petroleum administration has been pointing to just such a drive as this and a great mass of evidence has been accumulated to substantiate action by the courts. This evidence and any incidental services which the board can give will be at the disposal of the Department of Justice when it becomes active in prosecutions.

Martineau has intimated he will not take any action until he is thoroughly convinced he will be successful. It is his opinion there has been sufficient shadow boxing, and now is the time to get down to business. Consequently, he will make no statement as to what he plans to do.

Price Cut Threat

The threatened cut in the posted price of crude is causing much concern to administration officials. Almost no effort has been made by the federal government to enforce the production orders, although authority to enforce these orders is at hand in Section 9 (c) of the National Industrial Recovery Act. For the past few months the duty of enforcing the code has been vested in the Department of Justice, but no suits have been filed to restrict the interstate movement of illegally produced petroleum or products.

A meeting was called Saturday at which all the refiners in East Texas were urged to be present in an endeavor to revivify the gasoline buying plan under the Program Committee. This meeting was called at the request of the Oil Administration, and was attended by Ralph Horween and other administration executives in the field.

No action will be taken by the Program Committee to resume buying operations until approximately 95 per cent of the refining capacity of East Texas has signed contracts and agreements prohibiting production of oil in excess of allowables. It is believed if this activity were resumed, and an adequate majority of refiners signed the agreement and abided by it, the crisis could be passed without the destruction which will follow a cut in the price of crude.

Opinion of oil men generally is that if the Department of Justice would go to East Texas and indict and enjoin every one known to have handled "hot" oil or products, regardless of the evidence now in the hands of the prosecutors, a foothold could be obtained from which to work. It is realized by these men that practically all of the individuals and companies indicted or enjoined would probably in the end win the case, but in the process there would be some against whom an action would lie. These few cases could be brought up and tried immediately, and the moral effect on the field would be of inestimable value.

Price Fixing Sought

The Planning and Coordination Committee is considering asking Administrator Ickes to issue an emergency order establishing minimum or stop loss prices for gasoline throughout the country or, possibly, only in areas affected by price wars. This order would be issued under Section 6 and 6a of the code, which provides for the fixing of minimum prices with a constant of 18.5 between the price of 36 gravity Mid-Continent crude and the tank car price of U. S. Motor gasoline, Group 3.

Interstate Compact Favored by I.P.A.A.

OKLAHOMA CITY, Okla., Oct. 23.—Directors of the Independent Petroleum Association of America met here today to outline a program of action for the association and to consider matters relating to the session to be held here November 12 and 13 by the congressional committee investigating the oil industry with a view of recommending legislation to Congress when it convenes in January. At a meeting of the executive committee of the association held yesterday a plan was adopted providing for support of a modified Thomas-Disney bill which would include provisions for an interstate compact. It was felt a Federal agency should continue to set crude oil production allocations for the different states after the time limit of the petroleum code had expired and until such a time as an interstate compact might become effective.

Horween Tells East Texas Refiners New Buying Program Should Be Accepted

TYLER, Tex., Oct. 22.—Jules Constantin, president of the Independent Refiners Association of East Texas, told a meeting of 90 refiners at Gladewater Saturday night 82.6 per cent of the field's capacity had been signed for the gasoline buying agreement, additional promises raised the total to 87 per cent and 11 per cent, composed of six refiners, had not committed themselves.

One Federal official estimated 94 per cent of the field's throughput would be in line in the next few days. He said once the required signatures had been obtained and the consent of the buyers given the purchase agreement would be put into effect in less than a week.

There remained the problem of actually obtaining the signatures and arranging to iron out peculiarities of special cases. In once instance, a refiner found he would have to rid himself of a large storage of illegal oil—accumulated to fill a long-time contract at an attractive price—before he could enter the fold.

The drive for the new marketing agreement began with the arrival here of Ralph Horween, executive assistant to Mr. Ickes. Mr. Horween told the refiners they faced circumspection—what with the tender board and the intervention of the Department of Justice—and said he would rather see a resumption of the so-called buying program because it offers a legitimate way for every one operating in the field to stay in business.

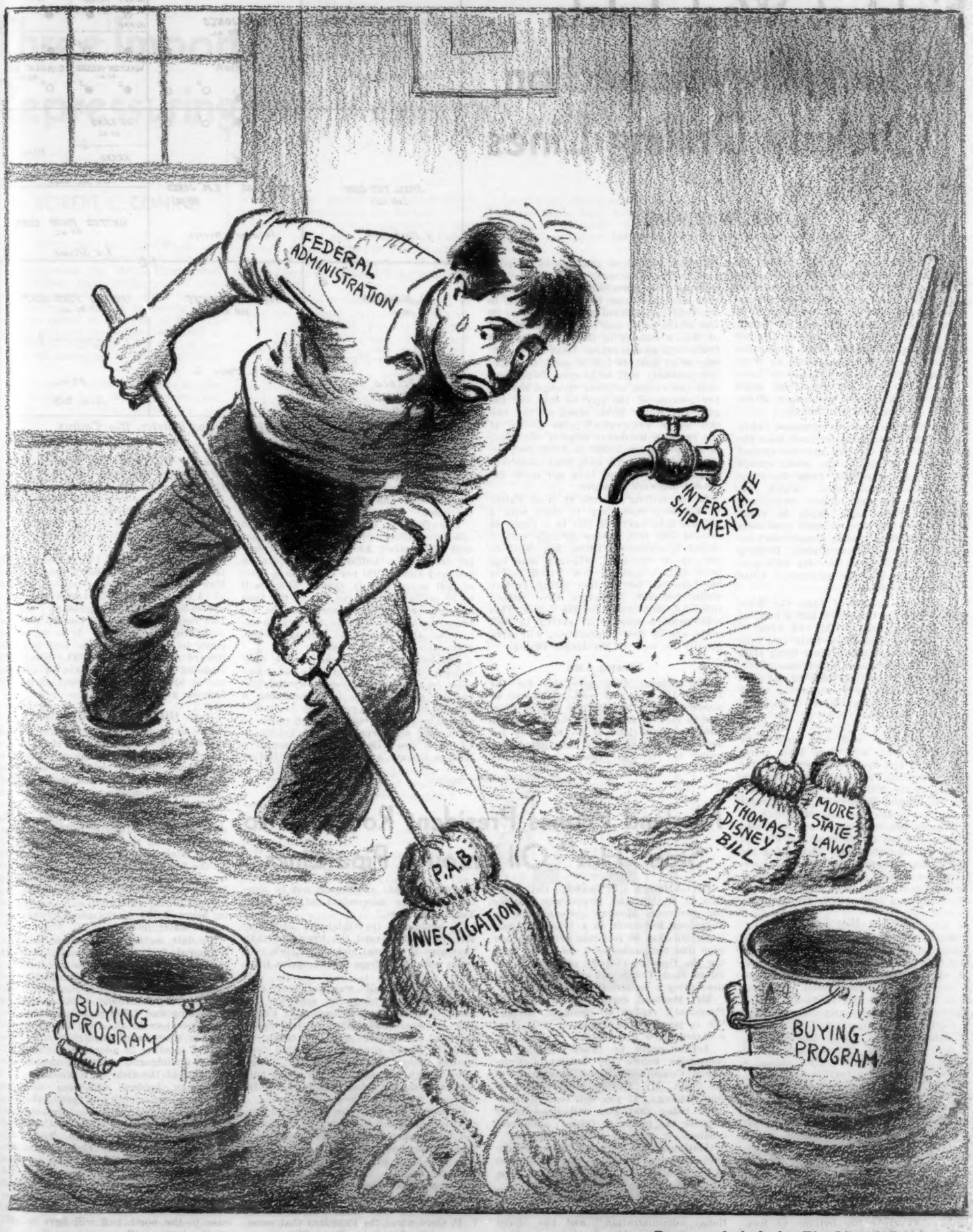
"I have not come down here as a salesman for the program committee but for the industry," Mr. Horween said. "I am not trying to sell the idea but to analyze the situation and point out a path which I think is very desirable. I believe a resumption of the buying program is preferable to going back to the other way, where everyone cut everyone else."

The revised agreement he suggested differed in three major respects from the old compact.

The former price of 5 cents a gallon would be paid refiners but that figure would be subject to fluctuation with the price of crude oil on the basis of one-fourth cent change in the price of the fuel for every 5 cent change in the price for crude.

Louis Green, manager of the district contact office for the PAB's program committee, told the refiners that should as much as 95 per cent of the capacity of the field sign contracts, a clause might be added setting forth that the signer retained his constitutional rights and the right of contesting any allocation figure.

"None So Blind - - -"



—Drawn exclusively for The Oil and Gas Journal

Field at West Tuleta Is Being Developed on Orderly Drilling Lines

By NEIL WILLIAMS
Gulf Coast Bureau, The Oil and Gas Journal

BEEVILLE, Tex., Oct. 22.—What has the earmarks of turning out perhaps the most important of a half dozen or more pools which have been opened in the so-called Pettus district is the new field which is being developed west of Tuleta and about 3 miles west of the original Tuleta area. Unlike the other pools, this field, which has been designated as West Tuleta, so far has been found to have a fairly uniform and consistent sand horizon and has given indications of extending over sizable proportions.

Characteristics of development until now in the Pettus district have been the irregularities in the pay and the spotted production. While all the pools, except one well, are producing from the same sand, the Pettus sand, which extends in blanket form over approximately the same depth in every pool, faulted and broken sand conditions have been encountered in almost every instance except at West Tuleta. Drilling has been treacherous, the dry hole percentage large and the productive areas comparatively small.

Opened the middle of June, the West Tuleta Field on October 6 had a total of 11 producing wells within an area of approximately 380 acres. Only two failures had been recorded, these being tests drilled on what is now the extreme northeast end of production, defining the field in that direction by encountering water in the sand. No irregularities of any consequence had been found in the other operations.

The discovery well was drilled by Dirks Brothers, who have been active wildcatters and operators throughout the Pettus district. This well, No. 1 Skinner-Harris, in the NE cor. W half NW Section 10, Ragsley Subdivision, was brought in making mostly gas but subsequent development has revealed it was bottomed only in the top of the sand and did not reach the saturated zone. That being the first well, however, the operators preferred not to risk drilling too deep. Since completion it has started making oil and now is flowing around 100 bbls. daily.

Over a Mile Long

With the recent completion by Al Buchanan of a well about three-quarters of a mile southwest of the discovery gasser, the field now is over a mile long, on a northeast-southwest trend. Previous wells had been to the northeast of the discovery, extending nearly three-quarters of a mile in that direction. The fact that the Buchanan well is high and apparently near the top of the structure would indicate that production might extend a considerable distance further southwest.

This well also has made largely gas, being high on the structure. It was in process of completion for several weeks due to efforts of the owners to blank off the upper portion of the sand. It topped the sand at minus 3,585 feet (subsea), the highest of any of the wells. Of particular interest, however, is that it drilled a total of 44 feet of solid sand section and still is in the sand at a total depth of minus 3,629 feet (subsea). It is producing only from the bottom 13 feet, making around 30 bbls. daily with a considerable volume of gas, due to its position on the structure.

Due to the uncertainty of sand thickness and the water table, other wells in the field have drilled only from 10 to 20 feet of the sand, and taking in nearly all of this, a number of the wells have had fairly high gas-oil ratios. With the knowledge of at least 44 feet of sand, the practice probably will be to core deeper and then run casing or liner through the upper portion of the pay to shut off the gas. The water level, based on the two salt water wells which were drilled at the extreme northeast edge of the field, is around minus 3,630 to 3,640 feet, although several wells have been completed below that level and have not made excessive amounts of water.

In the drilling of wells at West Tuleta it has been customary to start with a 15-inch hole, carrying this to a depth of around 300 feet, where 10-inch surface casing is cemented. From that depth to the top of the sand, 9⅞-inch hole has been drilled, and in this 7-inch casing has been run for the flow string. In late wells, however, operators have substituted 5½-inch casing for the 7-inch. This will mean a substantial saving in well costs, and in view of proration, will serve equally as well as the larger casing.

Flowing Life

The present daily allowable for the field is 125 bbls. per well, which can be produced easily through the smaller pipe, and in view of further restrictions as the field develops there is no necessity for any larger casing. It is anticipated that under the efficient production methods now followed, the wells will have a flowing life of at least three or four years, and naturally under such conditions there will be no occasion for deepening the holes.

The field is being developed on an orderly drilling program allowing one well to 10 acres. As there are no irregular lease lines, uniform spacing can be followed almost 100 per cent. On a basis of 380 acres already proved, there will be 38 wells in that area but as the field has not been defined except on the extreme northeast, there is no way to determine the amount of acreage which eventually will be proved.

The location of the field is on a well-defined "high" which extends for many miles in a northeasterly-southwesterly direction, along which, it is probable, a number of different pools may be uncovered. The entire Pettus district seems to be located on a regional high taking in all northern Bee County, southern Karnes County and northwestern Goliad County. The top of this high apparently is very flat as there is comparatively little variation in the depth at which the Pettus sand is encountered in any of the field. The various accumulations of oil or productive spots on this regional high are attributed to numerous local, minor highs or faults.

Like in the other Pettus sand fields, the oil produced at West Tuleta is fairly high in gravity, running between 46 and 47 A.P.I. However, it seems to have a substantially higher gasoline content, this ranging between 70 and 75 per cent on straight distillation. It is very light green in color and in one well it trends toward an amber color. The production is being taken locally, most of it being moved by tank trucks to one of two refineries at Pettus.

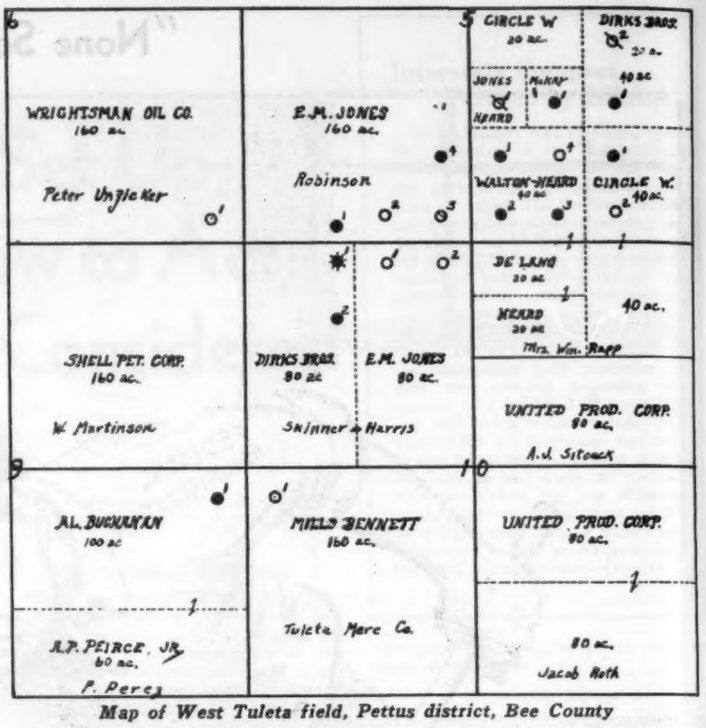
High Recovery Expected

The sand is expected to have a high recovery in comparison to that in the other Pettus fields. It has a porosity of around 30 per cent and with structural conditions in the reservoir more regular, the reservoir energy can be utilized to the greatest advantage.

West Tuleta, like other fields of the district, is in slightly rolling country, in contrast to the flat coastal plain off which is rises. The elevation of the wells in the field ranges from 270 to 345 feet with the top of the sand so far ranging from minus 3,585 feet (subsea), as topped in Al Buchanan's No. 1 Perez, to below 3,630 feet (subsea), the estimated water level.

To date no difficulties have been encountered from gas pressures, although the top 6 or 7 feet of the sand carries considerable gas under substantial pressures. Wells usually are completed carrying pressures around 1,200 pounds on the tubing and 1,500 pounds on the casing. Operators in the field have co-operated in a study of conditions and have worked together in adopting the most efficient drilling and producing methods for the good of the field as a whole.

Acreage holders offsetting and in the immediate vicinity of production include Wrightsman Oil Co., United Production Corp., Shell Petroleum Corp. and Mills Bennett Production Co. The latter has just acquired the Gulf Production Co.'s 160-acre lease just east of the Buchanan and Blanco Perez lease and has made location for an east offset test to the Buchanan producer. Shell Petroleum Corp.'s lease offsets the Buchanan lease to the north and will have to offset the latter well.



Map of West Tuleta field, Pettus district, Bee County

Marland Phones President Roosevelt to Stop "Hot" Oil Through Pipe Lines

OKLAHOMA CITY, Okla., Oct. 22.—Rep. E. W. Marland, Democratic nominee for governor, Monday recommended to President Roosevelt in a telephone conversation that he institute action against pipe line companies as a means of halting the flood of illegally produced crude oil in East Texas and at the same time preventing a reduction in the price of oil.

Mr. Marland declined to divulge the President's replies or comment, saying: "It is possible the President will issue a statement a little later."

Action could be taken against the companies before the Interstate Commerce Commission under provisions of the NRA, Mr. Marland told the President, adding: "If you will issue a statement today that you will immediately exercise the power to initiate such proceedings, it will cut overproduction."

Continuing, he argued: "This misconduct of overproduction—this production of illegal oil—is only possible when some pipe line company buys the oil."

Mr. Marland then cited the fact that Oklahoma has "played fair with the national administration," and has "lived up to the allowables fixed by the Federal Government and should not be punished for the misconduct of the East Texas operators."

In explaining the Oklahoma situation, Mr. Marland warned the President that "business in general and the State's revenues will suffer from a lower price from oil."

This phone call was followed two hours later by telegrams sent by the State Corporation Commission to President Roosevelt and Secretary Ickes asking that immediate steps be taken to curb the Texas situation, asserting that "unless action is taken at once, Oklahoma, which has always lived up to and supported the oil administration, will be punished for the misdeeds of others."

Oklahoma's production record under the code was cited to show that the State had overproduced only a few times, but that for the last two months the production has been well within the Federal quotas.

A number of other telegrams were dispatched to Washington by business and oil leaders here. Last Saturday, Senator T. P. Gore wired the President that some

(Continued on Page 28)

Three Important Steps Must Precede Repressuring the Venango Sands

By ROBERT C. CONINE

OIL CITY, Pa., Oct. 22.—Three important steps must precede any attempt at repressuring the first, second and third Venango sands with air and gas. The inlet well should be cored and the cores analyzed, and the producing sand should be tested at intervals of 5 to 12 feet to ascertain the proper pressures to be applied to introduce 1,000 feet of air-gas per 24 hours for every foot of sand area.

The Venango sands show considerable variation throughout their thicknesses and cores from two wells, unless they are very close together, will show further variances. Porosity and permeability tests on these sands are enlightening. A first sand sample showed a porosity of 7.9 per cent and the permeability expressed in millidarcys was 3.68. Another sample of this sand had a porosity of 20.7 per cent, and permeability of 14.3, and still another sample had a porosity of 12.4 per cent and permeability of 0.531 millidarcy. Second sand samples tested as follows: 17.2 per cent porosity and 53.3 permeability; 5.8 per cent porosity and 3.34 permeability; 23.6 per cent porosity and 136 permeability; 15.1 per cent porosity and 0.063 permeability. Third sand samples showed the following variations: 10.2 per cent porosity and 0.403 permeability; 11.9 per cent porosity and 1130 permeabiliay; 24.9 per cent porosity and 148 permeability; 21.9 per cent porosity and 417 permeability.

The third sand is reached at depths ranging from about 650 feet to 1,100 feet, the shallower depths being on the flats. The second sand is generally 140 feet nearer the surface. While the first sand is productive in many places in the area around Oil City, it is known as a "flashy" sand and does not figure importantly in comparison with the second and third sand operations.

Methods Described

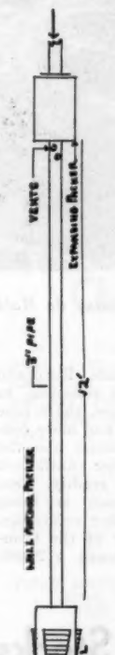
In the following will be described the methods of studying underground conditions preparatory to repressuring development on an extensive property near Petroleum Center. Production is from the second and third Venango sands. The average depth of the second sand is 500 feet, and that of the third 650 feet.

The third sand ranges from 40 to 50 feet in thickness and contains a number of strata in pebbles in sizes from bird-shot to half an inch diameter. The second sand shows similar irregularities, and both sands are characterized by horizontal laminations of shale which permit movement of the repressuring medium along the bedding plane and prevent vertical movement.

On this property all of the intake wells are cored. The "pressure" well is located near the center of four oil producing wells. The "biscuit" cores are carefully washed as they are taken from the well and laid in proper order in a long narrow box. The depths at which the biscuits were taken is recorded along the length of the box. Several inches of core will soon be oozing oil, while the strata above and below will be practically barren. Other biscuits will appear to be barren and several days later will be found to "sweat" oil. However, the practice of allowing cores to remain exposed to the air for several days before testing in the laboratory is not favored.

Usually the completed core sections are carefully sealed and forwarded to Pennsylvania State College, at State College, Pa., where tests are run free of charge in the School of Mineral Industries laboratories.

When coring is completed the well is ready for pressure testing. A length of 3-inch pipe is equipped on one end with a hook wall packer which requires a half turn to let out the gripping iron clips, and on the other end with a rubber packer which is expanded after the hook wall packer is fast in place. The length of pipe between the two packers may be from 5 feet to 12 feet. The pipe is lowered into the hole with the sidewall packer end down, and testing is started at the bottom of the third sand. A study of the core will indicate the approximate



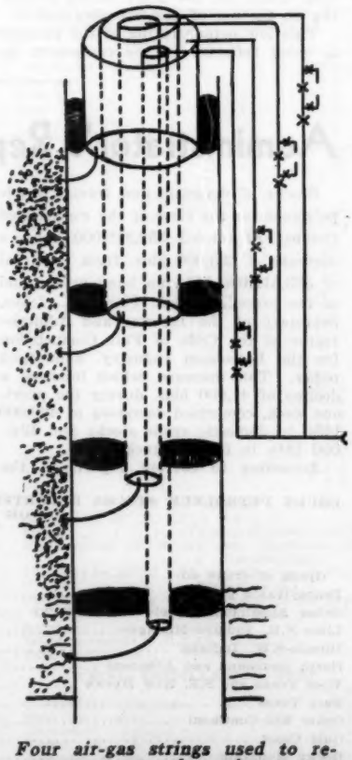
Pressure-volume testing string. The hook-wall packer is set at the bottom of the sand section to be tested, after which the rubber packer above is expanded to seal the section at the top. Air-gas is then introduced and the pressure necessary to inject 1,000 feet each 24 hours per foot of sand under test is noted. The distance between the packers may be varied as core indications require

spacing between the two packers. The pipe between the packers is vented.

The air-gas mixture is introduced to the portion of the sand between the two packers through the vented pipe. The object is to determine the pressure which will be required to force 1,000 feet of the air-gas mixture every 24 hours per foot of sand area in that particular portion of the stratum. If the packers are 12 feet apart the volume of repressuring medium required would be 12,000 feet. The pressure required to force in this much air-gas may range from 8 pounds to more than 250 pounds. In testing a 50-foot thickness of Venango third sand, it may be found that several feet should be sealed off as barren and wasteful of air-gas; another few feet, while rich, may be overlaid by a much looser stratum of oil-bearing formation which would take practically all of the air-gas unless repressured separately. In a single well on this property as many as five different sections of the third sand are repressured separately. The pressure testing pipe is moved upward and the second sand is studied similarly. If all three sands are productive the tests are extended to the first sand. In the producing wells the perforated pipe is in the lowest oil bearing sand and oil from the other formations collects in the bottom of the hole.

Some of the characteristics of the three Venango sands have been described by Norman E. Maxwell, production manager of Crew-Levick Co., Titusville, as follows:

"The first sand occurs in spotted, small pools throughout the Oil City-Titusville district. These pools bear the least relationship to one another of any of the sands, but the general distribution determines the belt in which deposition was favorable for accumulation. This sand has been correlated with the Hundred-foot, Gantz and Fifty-foot of southwestern Pennsylvania. Many wells producing in the lower sands also take oil from the first. The texture of this sand is the most uniform of the three. Generally speaking, it is one stratum of a larger formation and consists of a well-compacted or cemented sandstone of fine and fairly uniform grain size. A characteristic of this sand is that it shows up well when first drilled and shot but falls off very quickly. This sand readily responds to air or gas repressuring. Lower pressures may be used than in the other sands, and since the sand is more uniform there is not the difficulty in channeling that is experienced in the other sands. An increase in production is noticed in a rather short time; this increase rises to a peak and thereafter declines very slowly. The amount of increase depends entirely on local conditions of oil content and the intensity of the repressuring program.



Four air-gas strings used to repressure strata of varying texture within the Venango Third sand. Volumetric control is obtained by manipulating valves on the lines leading from manifold

"The formation of the second sand is the most extensive in occurrence of the three; however, it is not everywhere productive. This sand has the unique feature of an apparently clear good sand, being dry. This sand splits, the upper member being known locally as the Red Valley or Lytle, and the lower member as the Salt or Second. In general it may be stated that this sand is relatively hard, fairly uniform in texture and grain size, although a stratum of conglomerate sometimes occurs. This sand takes pressure in a satisfactory manner but generally requires higher pressure and a longer time to respond.

Third Sand

"The productive acreage of the third sand is the largest of the three. It extends in an irregular outline and with different offshoots from Grand Valley through the region south of Oil City. Further south it is known as the Gordon. It is characteristically a pebble sand. This pebble stratum is generally at the top of the formation but others may come in at any place in the sand. It is really a loosely cemented conglomerate with a large range of grain size. Since it is deficient in cementing material and fine sand, it has a high porosity. Naturally the most porous strata are drained first, and this fact must be taken into consideration in any repressuring program in order to prevent channeling and short circuiting.

"Cores show the sand to contain many shale breaks, varying in thickness from that of a coat of paint to a foot or more. Their location and recognition are important when it comes to repressuring as a very thin layer of shale can act as an effective seal to any repressuring medium. The larger the number of cores taken and the greater the detail of the study of these cores, the more benefit the operator will receive. I have noticed that no matter how well the lease man or driller knows the sand, his conception of it was always changed after examining a core."

Introduction of air-gas at different pressures to four strata of different textures in the Venango third sand is indicated diagrammatically in the accompanying figure. Practically, each string may be cemented or sealed with a packer at the bottom of the stratum it is to supply through vents on the side. Otherwise, a weld may seal off each succeeding string. The important consideration, naturally, is to seal off each stratum in which different pressures are required. If rag packer and cement is used the cement is poured to the proper place through a pipe in order to avoid spread of the cement on the face of the sand to be repressured.

In operating with an installation of the above type, the data secured with the sand testing string, also shown here, governs the setting of the valves on each line from the manifold. In this particular well the lowest string carries sufficient air-gas to the sand at a pressure of 20 pounds. Pressures for the strata above, successively, are: 38 pounds, 9 pounds and 80 pounds. Above these strata are many feet of third sand which are completely closed off as cores reveal that these portions are barren.

Inlets Not Shot

Except in the case of old wells, or newer wells which for pattern arrangement or other reason are converted to inlet wells after having been shot as producers, inlet wells are rarely shot. Shot wells which are turned into pressure inlets (or rather, air-gas volume inlets) are difficult to control and may be so wasteful as to prove worse than useless. It may be interesting at this point to note that one operator, George H. Davis, of Titusville, makes it a practice to drill twin wells, hardly more than 6 feet apart. One of these wells is shot and the other is operated as the producing well. Mr. Davis is carrying on a dewatering operation, some of his wells pumping water for as long as three years before a good flow of oil is obtained.

Distillation of Iraq Oil Compares With Michigan and Crane-Upton Crudes

By C. O. WILLSON

View of the refinery at the Compagnie Francaise de Raffinage, Le Havre, France

Iraq, which has been the center of attention in international oil circles for several years, is now furnishing a crude supply on regular schedules for one refinery, with other plants to refine the crude in the immediate future. The present crude oil deliveries at the recently completed terminals of the Iraq Petroleum Co., Ltd., located at Haifa and Tripoli on the Mediterranean Sea, now approximate 40,000 bbls. daily and within another six months it is anticipated that these deliveries will be increased to 82,000 bbls. daily, which is the capacity of the line.

The new crude will be made available to refineries in Europe, which in most cases are located only a few hundred miles from the two terminals. According to present plans, refineries of the Anglo-Persian, Royal Dutch-Shell, French interests and an American group of companies which are associated in the Iraq project, will provide outlets for the bulk of the Iraq production and considerable new equipment has been installed or is now being built for the purpose of handling this particular grade of crude oil.

The Compagnie Francaise de Raffinage, a subsidiary of the Compagnie Francaise des Petroles, one of the four principal owners of the Iraq company, was the first company to secure a cargo shipment of the Iraq crude oil in August. In early September the company made the first run of the crude at its Le Havre, France, refinery. The plant is now refining the crude regularly.

Distillation Test

The physical characteristics of the Iraq crude are shown in the accompanying analysis. The latter was made in a foreign laboratory recently from crude taken from a tanker shipment and differs slightly in some of the characteristics when compared with analyses made of small field samples available in this country last year. Those familiar with the properties of the Iraq crude oil have compared it with the Michigan crudes and also the Crane-Upton crude of West Texas.

The data given in the distillation analysis are based on the foreign method of making tests and for that reason it is difficult to make exact comparisons with American crudes. From the refinery end the large sulphur content and the presence of hydrogen sulphide are important. This is reflected in the treating required for gasoline and kerosene, although no special difficulties have been encountered in making these products suitable for marketing. In the cracking end the usual precautions are being taken in refining high sulphur content stocks in order to minimize corrosion problems and reduce treating losses as much as possible.

The high sulphur content in the fuels will be objectionable to certain users but they are suitable for bunker fuel and the bulk of it will be absorbed in European marine markets. When refining to a low gravity fuel the cold test is high. An overhead distillate suitable for Diesel fuel is obtainable.

Low Octane Value

In actual operation, yields of 27 per cent gasoline are being obtained in the skimming or topping. With this recovery, the yields of kerosene distillate are small. In this connection an important characteristic of the gasoline not shown in the laboratory analysis is the low octane value of the straightrun gasoline. With the C.F.R. method of testing the octane rating of the gasoline usually has been under 50, the exact rating depending on the cut of gasoline obtained.

This low octane rating of the gasoline is being reflected in the equipment installed at refineries. While European markets are not as octane conscious as as those of the United States, the octane rating is being given more and more consideration in certain countries and the motor fuels of the higher antiknock ratings find outlets more readily. Due to this condition, emphasis is being placed on cracking, including reforming. At the Le Havre refinery of the Compagnie Francaise de Raffinage, a 2,800-bbl. reforming unit is being built, and at Martigues, in the south of France, where the company is building a new refinery, equipment which will be able to crack the heavier oils as well as reform the lighter fractions is being installed. The Le Havre refinery also has equipment for cracking gas oils.

With reforming equipment a small yield of low endpoint gasoline will be taken in the topping operation with a large yield of naphtha, the latter to be reformed in obtaining a finished motor fuel of suitable octane rating. By this process the kerosene distillate stocks can also be used as charging stock for the reforming operations if considered desirable.

Lubricating Oils

As shown in the accompanying distillation test, the possibilities of Iraq crude from the standpoint of lubricating oils are not attractive. It would be difficult to secure an oil of suitable viscosity, and the high sulphur content of the crude would complicate treating problems.

Le Havre Operation

As previously explained, the Le Havre operation of the Compagnie Francaise de Raffinage is being changed and enlarged so that it can more efficiently operate with the Iraq crude oil. This refinery, with a rated crude oil capacity of 16,000 bbls. daily, started operating in May, 1933. The crude supply was obtained from East Texas with other crudes obtained from Peru, Ecuador and Grozny, U.S.S.R.

The supply in the future will largely come from the Iraq, and with the additions now being made, the plant will be one of the two largest in France. When the refinery at Martigues is completed its total crude runs to stills will exceed those of any other company operating in France. The parent company—Compagnie Francaise des Petroles—has a 23.75 per cent interest in the Iraq Petroleum Co., Ltd. The French government owns an interest in the company, which is affiliated with several French companies with distributing facilities in

Administrator's Report on Crude Stocks

Stocks of domestic and foreign crude petroleum at the close of the week ended October 13 totaled 332,818,000 bbls., a decrease of 693,000 bbls. from the total of 333,511,000 bbls. on hand at the end of the preceding week, Harold L. Ickes, Secretary of the Interior and Administrator of the Code of Fair Competition for the Petroleum Industry, announced today. This decrease, which followed a decline of 41,000 bbls. during the previous week, comprised decreases of 499,000 bbls. in domestic crude stocks and 194,000 bbls. in foreign stocks.

According to current reports of the industry for the week ended October 13, in comparison with those for the previous week, daily average crude production increased approximately 50,000 bbls., and daily average imports were 40,000 bbls. higher. These increases in supply (including the greater withdrawal from stocks) were practically compensated by an increase in runs to stills of 180,000 bbls. The approximate daily average balance of crude oil during the week ended October 13 was as follows (bbls): Production, 2,522,000; imports, 97,000; decrease in stocks, 99,000; equals runs to stills, 2,435,000; exports, losses, etc., 283,000.

CRUDE PETROLEUM STOCKS REPORTED BY COMPANIES HOLDING 100,000 BBLS. OR MORE

Grade of crude oil	Stocks held by reporting companies Oct. 6, 1934 (Bbls.)	Stocks held by reporting companies Oct. 13, 1934 (Bbls.)	Change from Oct. 6, 1934 (Bbls.)
Pennsylvania grade	4,657,000	4,620,000	— 37,000
Other Appalachian, including Kentucky	1,151,000	1,156,000	+ 5,000
Lima-N.E. Indiana-Michigan	1,395,000	1,456,000	+ 61,000
Illinois-S.W. Indiana	11,488,000	11,415,000	— 73,000
North Louisiana and Arkansas	10,243,000	10,159,000	— 84,000
West Texas and S.E. New Mexico	29,888,000	30,254,000	+366,000
East Texas	34,616,000	33,512,000	—1,104,000
Other Mid-Continent	156,967,000	157,402,000	+435,000
Gulf Coast	18,518,000	18,360,000	—158,000
Rocky Mountain	27,752,000	27,746,000	— 6,000
California	33,914,000	34,010,000	+ 96,000
Total domestic crude	330,589,000	330,090,000	—499,000
Foreign crude	2,922,000	2,728,000	—194,000
Total crude	333,511,000	332,818,000	—693,000

France. The two refneries are expected to take all of the Iraq production to which the French interests are entitled, and this crude will be refined at the two plants. Distribution is obtained through the French affiliated companies. In addition, outside companies distributing in France are obligated to take up to 25 per cent of the output of the two refineries.

Predistilling Unit

At Le Havre refinery, as shown in flow chart, there is a predistilling plant through which all incoming crude oil passes before going to storage tanks and to the main topping units. This preliminary operation was adopted by the management in order to remove the most volatile gasoline fractions, sediment and suspended water as well as dissolved gases from the crude arriving at the refinery. The advantages claimed are a stabilized crude supply in storage with a substantial reduction in losses of the light gasoline fractions. It is also contended that the corrosion problem is reduced by this method of operation with longer periods on stream and a greater throughput than would otherwise be possible.

The light gasoline taken off in the predistilling plant is condensed and all the undesirable light hydrocarbons and hydrogen sulphide are removed from it in a special stabilizing unit. This light gasoline of controlled vapor pressure is plumbite treated and sent directly to storage tanks.

Edeleanu Unit

An interesting feature of the refinery is a large Edeleanu plant in which raw kerosene distillate is treated by means of liquid sulphur dioxide. The working capacity of this installation is nearly 3,000 bbls. daily and a satisfactory lamp oil is obtained by this method of treating.

The original cracking equipment included two Cross units suitable for cracking overhead gas oils and residual products.

The improvements now under way and which are indicated in the flow chart, include a vacuum distillation plant which will handle the residue from the two atmospheric distillation units. In this operation, material suitable for asphalt manufacture will be obtained as a residual product with two low gravity distillate cuts which will be used as cracking stock.

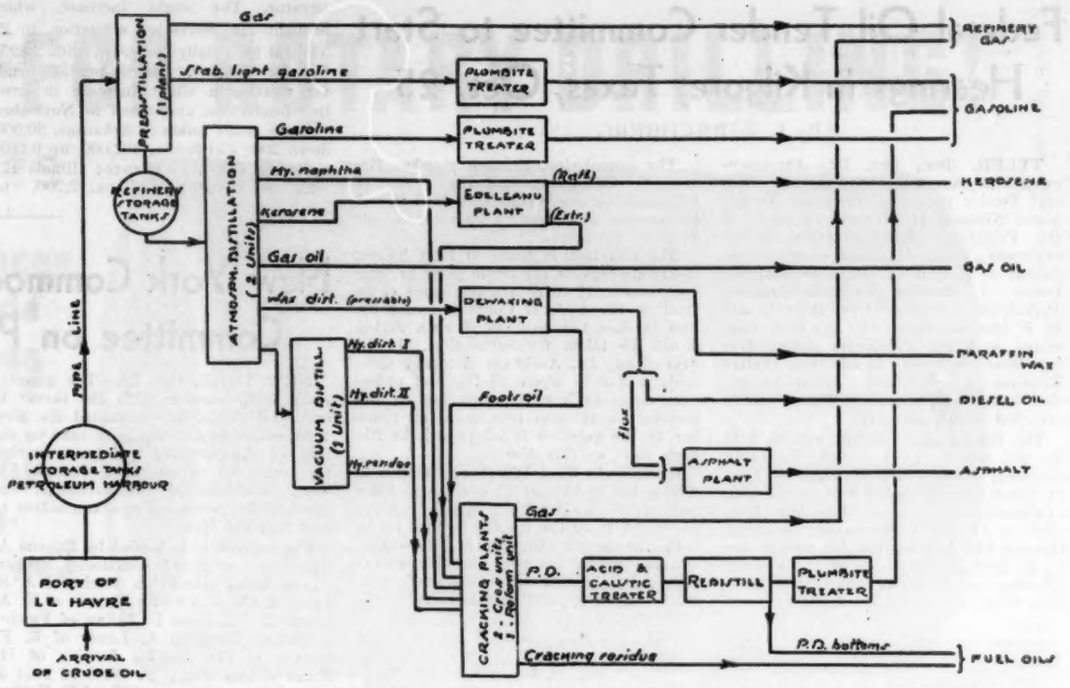
This arrangement also provides for the manufacture of paraffin wax for which there is an excellent market in France and other European countries. Under this operating setup as shown in the chart the filtered oil will be used as flux in the manufacture of asphalt or sold as commercial grade Diesel oil. Its use as lubricating oil will depend on the crude supply. The foots oil will be sent to the cracking plants.

The reforming unit will be operated with a heavy naphtha cut and will supplement the two Cross operations cracking heavier stocks. The increase in production of cracked gasoline will necessitate an extension to the present treating plant and a second acid and caustic treater is to be added.

New Equipment

Although all the new equipment is being built in France, American manufacturers have had a part in its design. The vacuum unit, which has a rated capacity of 5,500 bbls. daily, is being built by Schneider & Co. of France affiliated with Arthur G. McKee Co., Cleveland, Ohio.

The naphtha reforming unit of 2,800-bbl. capacity was designed by the M. W. Kellog Co., whose European representatives are Compagnie Technique Des Petroles of Paris. The wax plant will have a throughput of 1,750 bbls. of pressable wax distillate daily. The equipment will come from various French manufacutrers but part of the plant has been designed by Brno-Kraloposka of Czechoslovakia and A. F. Craig & Co., Paisly, Scotland. This latter company holds the manufacturing rights for the Allan-Moore wax sweating stoves which have been developed at Rangoon, Burma.



Flow chart illustrating operation of Le Havre, France refinery of Compagnie Francaise de Raffinage when present improvements are completed. This refinery was the first major plant to operate with Iraq crude oil.

Distillation Tests and Detailed Physical Characteristics of Iraq Crude Oil

In this analysis, the Iraq crude is distilled to determine the content of the various cuts. These fractions are in turn analyzed for volatility, gravity, viscosity, color, odor, flash, sulphur, and cold tests.

GENERAL

Gravity at 60° F.	35.8 A. P. I.
Flash	Room temperature
Sulphur	2%
Color	Dark brownish red.
Odor	Unpleasant, due to presence of hydrogen sulphide.

FIRST DISTILLATION TEST—TO DETERMINE GASOLINE, KEROSENE AND FUEL OIL CONTENT

Products obtained—	Pct. in volume
Raw gasoline	21.2
Raw kerosene	7.9
Fuel oil residue	69.8
Loss	1.1
Raw gasoline—	
Gravity, A.P.I.	69.2
Odor	unpleasant
Initial, °F.	86
Endpoint, °F.	329

Raw Gasoline—Distillation

Temp. °F.	Per cent recovery
104	1.0
122	3.5
140	9.0
158	16.0
176	28.0
194	37.0
212	49.5
230	62.0
248	74.0
266	84.0
284	91.0
302	94.0
320	96.0
Recovery	97.5
Residue	1.5
Loss	1.0

Raw Kerosene—Distillation

Gravity, A.P.I.	50.6
Flash, °F., Abel Pensky	87
Odor	unpleasant
Color (Lovibond)	(*)
Initial, °F.	296
Endpoint, °F.	412

*Water white.

Kerosene—Distillation

Temp. °F.	Per cent recovery
302	2.5
320	50.0
338	78.5
356	89.0
374	94.0
392	96.0
410	97.0
Recovery, %	98.0

Fuel Oil Residue

Gravity	25.4 A.P.I.
Flashpoint	(Pensky-Martens) 192°F
Viscosity at 60° F.	305 sec. (Redwood No. 1 Viscosimeter).
Viscosity at 100° F.	97.5 sec. (Redwood No. 1 Viscosimeter).
Calorific power	10,620 calories per gram 19,116 B.t.u. per lb.
Sulphur	2.54%
Hard asphalt	2% (I.P.T. method)
Cold test	Below 0° F. (A.S.T.M.).

SECOND DISTILLATION TEST—TO DETERMINE GASOLINE AND FUEL OIL CONTENT

Products obtained—	Pct. in volume
Raw gasoline	26.8
Fuel oil	71.2
Loss	2.0
Raw gasoline—	
Gravity, at 60° F., °A.P.I.	64.0
Odor	unpleasant
Initial, °F.	86
Endpoint, °F.	274

Distillation

Temp. °F.	Per cent recovery
104	1
122	3
140	6
158	9
176	16
194	24
212	32
230	40
248	49
266	60
284	71
302	81.5
320	89.5
338	94.0
356	96.5
Recovery	97.5
Residue	1.5
Loss	1.0

Fuel Oil Residue

Gravity at 60° F.	25.9 A.P.I.
Flash	(Pensky-Martens) 186°F.
Viscosity at 60° F.	252 sec. (Redwood No. 1 Viscosimeter)
Viscosity at 100° F.	90 sec. (Redwood No. 1 Viscosimeter)
Calorific power	10,670 calories per gram 19,206 B.t.u. per lb.
Sulphur	2.44%
Hard asphalt	2.9% (I.P.T.)
Cold test	Below 0° F.

THIRD DISTILLATION TEST

Products obtained—	Pct. in volume
Gasoline	21.2
Kerosene	26.3
Diesel oil	12.2
Lubricating oil	21.9

Note soft tar represented 26.5 per cent in weight with loss of 1.3. Paraffin was 2.7 per cent by weight.

Gasoline—Same characteristics as obtained in Distillation No. 1.

Kerosene

Gravity, 60° F., °A.P.I.	45.4
Flash (Abel), °F.	118
Odor	unpleasant
Initial, °F.	329
Endpoint, °F.	572

Distillation

Temp. °F.	Per cent recovery
350.6	10
359.6	20
374	30
390.2	40
408.2	50
428	60
449.6	70
476.6	80
518	90
Recovery	98.5
Residue	1.5

Diesel Oil

Gravity, at 60° F.	34.6 A.P.I.
Flash	(Pensky-Martens) 235°F.
Vis., at 60° F.	46 sec. (Redwood No. 1 Viscosimeter)
Calorific power	10,900 calories per gram 19,620 B.t.u. per lb.
Sulphur	1.16%
Cold test	25° F.

Lubricating Oil

Gravity, at 60° F.	25.2 A.P.I.
Flash	(Pensky-Martens) 300°F.
Vis., at 100° F.	115 sec. (Redwood No. 1 Viscosimeter)
Vis., at 140° F.	59 sec. (Redwood No. 1 Viscosimeter)
Cold test	80° F.

LEE C. MOORE TO BE HONORED

The Mid-Continent section of the American Society of Mechanical Engineers and the Young Engineers Club of Tulsa are uniting in paying their respects to Lee C. Moore, the oldest member of the A.S.M.E. in the Mid-Continent area and a member of the society since 1902, at a special Dutch lunch at 6:30 p.m. Friday, October 26, at the Tulsa Building, Tulsa.

William G. Heltzel, general superintendent, Stanolind Pipe Line Co., will act as toastmaster and Hollis P. Porter, chairman of the Mid-Continent section, will speak on "The Evolution of the Petroleum Engineer," and H. F. Brindel, former chairman, will give "Rebuttal."

PIPE LINE INVESTIGATION

WASHINGTON, D. C., Oct. 22.—Administrator Ickes has been advised by the Planning and Coordination Committee that the committee saw no necessity at this time for investigating pipe line rates and practices in view of proceedings pending before the Interstate Commerce Commission.

The Planning and Coordination Committee pledged its full co-operation to the I.C.C. in its pipe line probe.

Federal Oil Tender Committee to Start Hearings in Kilgore, Texas, Oct. 25

By L. E. BREDBERG

TYLER, Tex., Oct. 22.—Announcement was made here today that the Federal Tender Board is comprised as follows: Norman L. Meyers, secretary of the Petroleum Administrative Board, chairman; Ralph Horween, executive assistant to Harold L. Ickes, oil administrator; J. Howard Marshall, member, Petroleum Administrative Board; and M. F. McCorquodale, who has been associated with the Petroleum Administrative Board in Tyler. In addition, Walter Behrens, a Petroleum Administrative Board investigator in East Texas, will be attached to the committee.

The first tender hearing will be held by the board at 11 o'clock Thursday morning, October 25, at Kilgore, Tex., at which time the board will consider all applications for tenders which have been filed by 11 o'clock Wednesday morning, October 24. Applications for tenders are to be filed at the office of the Federal Division of Investigations at Kilgore, Tex. While no official statement has been made it is understood the tender board will hold meetings daily to consider tender applications. This would indicate members of the board will make their headquarters at Kilgore for some time to come.

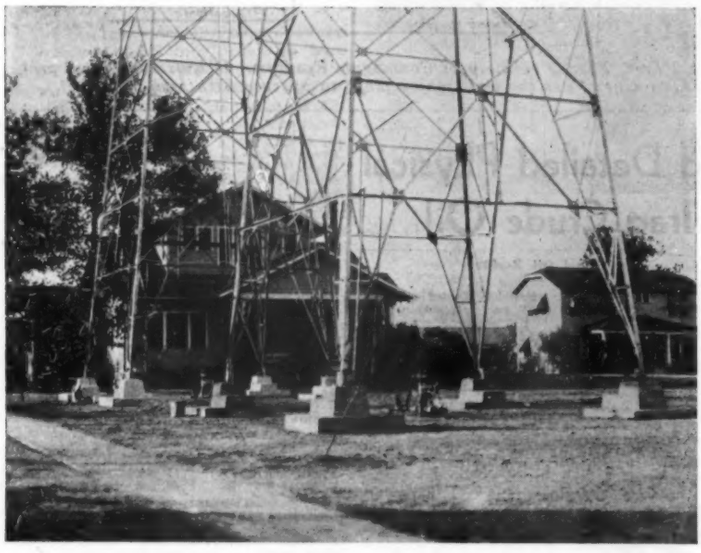
The Texas Railroad Commission is getting "jittery" over the situation in East Texas, well knowing that a crude price cut is hovering over the field because of lack of curtailment of "hot oil" production by the commission and inaction by the Federal forces. Between 100,000 and 128,000 bbls. of hot oil per day is estimated being produced in the field.

The Texas Railroad Commission telegraphed U. S. Senators Tom Connally and Morris Sheppard urging action by Federal Government today for injunction suits to stop movement of gasoline from hot oil, saying a price cut will cost Texas hundreds of millions of dollars. The senators replied that Mr. Martineau of the U. S. Department of Justice left today for Tyler and will proceed with oil suits with all speed possible under the law. They asked, at the commission's request, that the Federal Government move swiftly in injunction suits to halt the movement of illegally produced oil and refined products of oil in interstate commerce.

The commission, through member Ernest O. Thompson, said they regarded this step as one which will curb illegal production and avert a threatened collapse in the market.

The situation is tense in East Texas. Everyone expects the crude price to tumble at once if there are not some cases filed in the Federal Court immediately, and it does not look as if such action would be taken for some time. L. R. Martineau, Jr., Assistant Attorney General, is due in Tyler to file and prosecute cases against violators, but as the Federal Court term terminated on October 18 the question is where will he file such suits at this time?

Gasoline in Fort Worth and Dallas is selling for 9, 11 and 13 cents, one independent dealer in Fort Worth causing the majority of the trouble in that town, with the result that other independent station owners are now checking everybody going in and out of his store with the intention of starting a boycott.



Picture showing two closely drilled wells in the Kilgore townsite, East Texas. They are about 50 feet apart and are exceptions to the Railroad Commission's spacing rule. Such close drilling is being carried on in many parts of the field, but more especially in the townsites

Pipe line runs from the field averaged 382,690 bbls. per day during the week. Runs to local refineries increased to 125,400 bbls. per day, which means that around 2,006,480 gallons of gasoline were refined for shipment each day during the week. Twenty-six of the plants were shut down this week, leaving 57 operating. Tank car shipments averaged 478 cars per day for the week.

Thompson Preparing Texas Shutdown Order

AUSTIN, Tex., Oct. 23.—Railroad Commissioner Ernest O. Thompson of Texas today was preparing the form of an order shutting down all oil production in the State, "to be held for use if necessary," he announced, in case the cut of crude oil prices, started Tuesday by Atlas company in East Texas, should spread or threaten to become general.

Crude Allowable Raised Slightly for November

WASHINGTON, D. C., Oct. 22.—An increase of 14,500 bbls. daily in the national allowable production of crude oil was authorized for November in an order approved by the Petroleum Administrator. The slight increase, which brought the November allocation to 2,340,300 bbls. daily compared with 2,325,800 for October, was to provide crude for meeting a slight increase in gasoline production authorized in November.

State totals follow: Arkansas, 30,000, down 200; California, 462,000, up 9,700; Colorado, 3,000, no change; Illinois 12,000, no change; Indiana, 2,200, no change; Kansas, 125,000, up 1,300; Kentucky, 11,500, no change; Louisiana, 90,000, up 1,700; Michigan, 29,000, no change; Montana, 8,500, down 300; New Mexico, 47,000, up 1,200; New York, 10,000, down 100; Ohio, 12,000, no change; Oklahoma, 459,300, up 1,900; Pennsylvania, 37,200, down 1,200; Texas, 957,300, up 1,200; West Virginia, 11,100, no change; Wyoming, 33,200, down 700.

New York Commodity Exchange Names Committee on Petroleum Exchange

NEW YORK, Oct. 22.—The gasoline price war, together with the threat to crude oil prices, has prompted the New York commodity exchange to take up the idea of inaugurating a futures market for crude oil or gasoline. Jerome Lewine, president of the exchange, announces the personnel of a committee to look into the idea.

The committee is headed by Eugene A. Canalizo, prominent commodity broker, and includes Harold L. Bache of J. S. Bache & Co., J. Chester Cuppia of E. A. Pierce & Co., John L. Julian of Fenner & Beane, Theodore A. Lauer of E. F. Hutton & Co., Jerome Lewine of H. Hentz & Co., Philip B. Weld of Post & Flagg, James Coker and Floyd Y. Keeler.

The committee is representative of leading Wall Street security and commodity commission houses, with branches throughout the country and abroad.

"For some time," Mr. Lewine's announcement said, "the exchange has been contemplating the establishment of an oil futures market. Impetus has recently been given to this movement by the price war which has broken out in the oil industry.

"Trade papers have mentioned favorably the desirability of establishment of an oil exchange as a price stabilizing factor. The petroleum committee of the Commodity Exchange, Inc., at the present time is studying the comparative advantages of a crude oil contract and a gasoline contract.

The exchange is understood to have first considered a market for crude oil futures some time ago, but at that time, in so far as can be learned, received little encouragement from the office of Oil Administrator Ickes in Washington. Through the efforts of the administrator, crude oil has been held stable at about $1 a barrel for about a year, and little opportunity of futures trading has existed.

Some commodity exchange quarters have felt that trading in gasoline futures would be more feasible. They point out many small dealers probably have suffered considerable losses as a result of the recent price war, which they need not have suffered if they could have hedged in a futures market.

One Wall Street proponent of the futures market says there has been considerable agitation for an exchange by oil dealers on the Pacific Coast.

San Antonio Geologists Prepare Laredo Program

LAREDO, Tex., Oct. 22.—A schedule of papers on timely geological subjects and two field trips of considerable importance have been arranged for the sixth annual meeting of the San Antonio section of the American Association of Petroleum Geologists to be held in Laredo November 2 to 5, inclusive.

The first day, Friday, November 2, will be devoted to a field trip, in which the Jackson, Frio, Catahoula and Oakville formations in McMullen and Duval Counties will be studied, and will include visits to the Jacob and Callihan Fields in McMullen County, and the Government Wells group of fields in Duval County. The trip will start at Campbellton, 50 miles south of San Antonio, in Atascosa County. The party, which will be conducted by Herschel H. Cooper, Stuart Mosson and Kenneth H. Crandall, will leave promptly at 8 o'clock a.m. A barbecue will be given by the Humble Oil & Refining Co. in the Government Wells Field at noon.

The second day, Saturday, November 3, will be devoted to the presentation of the scheduled technical papers and discussions, the meeting to be held in the Plaza Hotel at Laredo, beginning at 9 o'clock. The program includes the following:

"Discussion of the Correlation Chart, Southwest Texas," by Ed W. Owen, San Antonio, Tex.

"The Relationship of the Vicksburg Group to the Formations Which Overlie It in Mississippi," by Dr. Henry V. Howe, Baton Rouge, La.

"The Corpus Christi Structural Basin as Mapped by Salinity Data," by Dr. W. Armstrong Price, Corpus Christi, Tex.

"Symposium on the Government Wells Field, Duval County," by J. B. Whisenant, John Trenchard, of San Antonio, and Kenneth H. Crandall, Alice, Tex., and E. C. Rach, Austin, Tex.

"Geology of a Portion of the Tertiary of Northeastern Mexico," by J. Laird Warner, McAllen, Tex.

"Claiborne Possibilities of Laredo Area," by Frith C. Owens and William F. Calohan, Laredo, Tex.

"Correlation Between Some Deep Wells Along the Balcones Fault Zone in Southwest Texas and Some Wells in Northern Mexico," by an author to be announced later.

"The Cole Field, Webb County, Texas," by Richard T. Short, Laredo, Tex.

Sunday and Monday will be devoted to a field trip over northern Mexico. The trip will be conducted by William G. Kane, A. H. Petsch and J. Laird Warner, and will start from Nuevo Laredo, across the border from Laredo. The trip will extent from Nuevo Laredo to Vallecillo, on the Monterrey Highway, thence eastward across the entire Tertiary section up to the Oligocene, thence to the Rancherios Field, where the night will be spent at the Ohio-Mex camp. From Rancherios the trip will take the party eastward across the San Juan River to the Oligocene area south of the Sam Fordyce Field in Hidalgo County, Texas, thence southwestward to Monterrey.

Petroleum Geologists to Wichita in March

The twentieth annual meeting of the American Association of Petroleum Geologists will be held in Wichita, Kans., March 21, 22, and 23, 1935. The officers of the association are: William B. Heroy, president, New York City; Frank R. Clark, past president, Mid-Kansas Oil & Gas Co., Tulsa; Edwin B. Hopkins, vice president, Dallas, Tex.; M. G. Cheney, secretary-treasurer, Coleman, Tex.; and L. C. Snider, editor, New York City.

The general chairman of the local committee on arrangements, appointed by the Geological Society of Kansas, who will act as hosts at the meeting, is E. C. Moncrief, Derby Oil Co., Wichita, Kans.

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Form of Clay Suspensions Important Factor in Study of Drilling Fluids

By W. K. LEWIS, LOMBARD SQUIRES and W. I. THOMPSON*

Clays consist predominantly of hydrated silicates of alumina. The formula is frequently assumed to be $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$, and certain of them undoubtedly have substantially this composition, but, in general, the ratio of silica to alumina is considerably higher. However, they always contain water of chemical constitution as shown by Table 1.

The behavior of clays is largely determined by the properties of the individual clay particles, most important of which are size, shape and surface characteristics. There is little doubt that plastic, clay-like properties are not developed until the particle size is below about 0.01 mm. The lower limit is not known, although the existence of particles as small as 2×10^{-6} cm. in diameter has been reported. Clays also contain appreciable percentages of particles larger than 0.01 mm., usually considered as impurities, silt, sand, etc. Due to their size, below the resolving power of the miscroscope, the shape of the particles is difficult to determine. Several observers have reported the presence of flat, plate-like crystals in clay when examined miscroscopically. Whether this is true of all clays is not known, but facts point to the

TABLE 1

Analysis—	Gumbo clay*	Bentonite†
SiO_2	38.98	50.30
Al_2O_3	11.36	15.96
$Fe_2O_3 + FeO$	2.60	0.86
$CaO + MgO$	23.70	7.77
$K_2O + Na_2O$	2.18	2.64
H_2O	3.06	23.61
Moisture	*18.80	.....
SO_3	.....	.....
TiO_2	0.7	.....
CO_2	(18 80)	.....
Al_2O_3/SiO_3	0.1852	0.197
CaO/Na_2O	.....	5.08

*San Antonio, Tex., gumbo clay, fine grained, highly plastic. Moisture and CO_2 were determined together at 18.8 per cent.
†Selected crude bentonite, California.
(Data taken from "Clays" by H. Ries, John Wiley & Sons, New York, 1927).

conclusion that even the small particles may be plate-like. Thus, most bentonite suspensions show double refraction when flowing in viscous motion, indicating that the particles are anisotropic. Furthermore, many of the typical clay minerals are shown microscopically to occur as plates or bunches of plates. Pure kaolin exhibits a marked X-ray pattern, showing the presence of crystalline particles. From the above evidence it may be inferred that clays are composed largely of exceedingly fine, plate-like crystals of the "clay" minerals, contaminated with varying amounts of sand, organic matter, and the like.

This paper is concerned primarily with the behavior of clay suspended in water. Under these conditions the clay particles possess appreciable electric charge, as shown by their migration in an electric field. Under almost all conditions the charge is negative. It is possible to "plate" out the particles on a suitably prepared electrode, building up layers of considerable thickness. The magnitude of the charge per particle varies widely and the charge can be neutralized and even reversed, particularly by polyvalent cations. The particles are so small that, while not resolvable by the microscope, they can be seen to exhibit Brownian movement in considerable degree. However, for the production engineer, the most important properties of aqueous suspensions of clays are their characteristics from the point of view of flow and gelation. Hence the following discussion will be directed almost exclusively to a study of these problems, but in order to understand them it is necessary to have a clear picture of the behavior, not merely of clay suspensions, but of other types of fluids as well.

*Author's title: "The Colloidal Properties of Clay Suspensions." Contribution from the department of chemical engineering, Massachusetts Institute of Technology, Cambridge, Mass.
Before fall meeting, Petroleum Division, A.I.M.E., October 12, Tulsa.

Viscosity

The best way to determine the viscosity of a pure liquid is the use of some form of capillary viscosimeter. If, however, such an instrument be employed for suspensions, or solutions of materials of high molecular weight, difficulties are frequently encountered, probably due to irregularities of flow caused by the fact that the particles themselves have dimensions approaching that of the diameter of the capillary. In such cases a viscosimeter of the falling ball or concentric cylinder type is advantageous, since the thickness of the liquid layer is far greater; the latter has the further advantage that it can be operated with rates of shear which are approximately the same at all points in the fluid. All instruments of this type measure the torque at some rate of rotation, the viscosity being proportional to the twisting force and inversely to the rate of rotation.

If, in such a torsion viscosimeter, the rate of rotation be varied, in testing all pure liquids and many solutions, even of high molecular weight solutes and suspensions, one finds that the torque is proportional to the rate of twist, i.e., to the revolutions per minute. However, many suspensions and colloidal solutions show an entirely different behavior in that, if one plot torque vs. r.p.m., while one still finds a relationship substantially linear, the line no longer passes through the origin, but, if extended below the experimental range, to zero r.p.m. cuts the torque axis at a different point.

This is called yield point of the fluid. Possession of a yield point thus determined may well be taken as a criterion of plasticity.

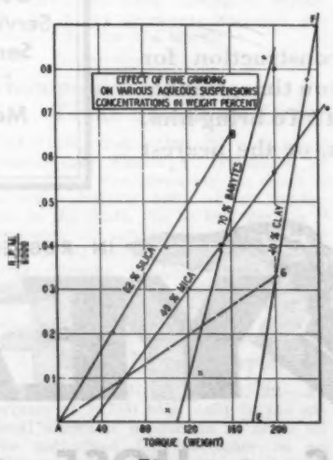

Figure 1

It is clear that for a fluid with zero yield point the slope of the r.p.m.-torque curve is inversely proportional to its viscosity, i.e., directly proportional to its fluidity. For a fluid showing a yield point, the fluidity for a given rate of shear is proportional to the slope of the line connecting the point in question with the origin, eg., on Figure 1, for the fluid represented by the line EF, at the point G, the fluidity is the slope of the dotted line connecting G with the origin. Inspection of the diagram shows that the viscosity of the fluid represented by the line EF is changing progressively and rapidly with the r.p.m., i.e., with the rate of shear. Because the slope of the r.p.m.-torque line is a measure of the fluidity for fluids with zero yield point, Bingham has suggested that in other cases the corresponding slope be called the mobility. For fluids with zero yield point, fluidity and mobility become identical. Study of the diagram makes it clear that for fluids exhibiting yield point the mobility is the fluidity (i.e., the reciprocal of the viscosity) of the fluid for conditions of infinite rate of shear.

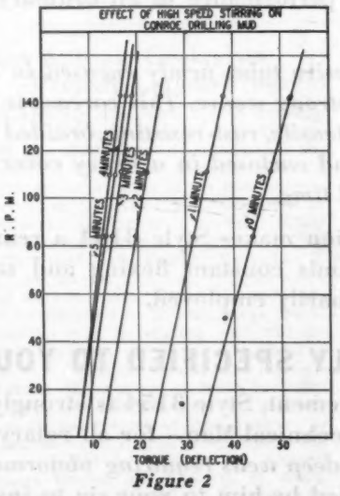

Figure 2

Postulate a suspension of particles of definite volume, unchanging with rate of shear. From the analysis on which the Einstein equation discussed below is based, the viscosity should be constant, independent of rate of shear.

Yield Point

Figure 1 shows data on the r.p.m.-torque relation as determined with a Stormer viscosimeter for (1) a suspension of finely ground quartz in water, (2) and (3) suspensions of barytes and mica similarly prepared, and (4) a suspension of a typical china clay. Inspection of the diagram shows that the quartz exhibits no detectable yield point, that the mica and barytes both show a yield point, unmistakable even though small, whereas the clay is characterised by a very high yield point value.

Figure 2 shows the influence on the viscosity behavior of the clay of violent agitation immediately prior to testing. Curves (1) to (6) correspond to times of preliminary agitation of 0, 1, 2, 3, 4 and 5 minutes, respectively. It is seen that while one minute greatly decreases the yield point, longer agitation produces progressively less effect. The agitation also increased the mobility, but in far less degree than the change in yield point. These changes can be visualized more readily from Figure 3.

Figure 4 shows the influence on clay suspensions all containing identical quantities of clay per unit volume, of the character of the suspending liquid. Clay suspended in 95 per cent alcohol shows a mobility practically the same as that of the clay suspended in the water, but its yield point is approximately 50 per cent higher. Concentrated hydrochloric acid decreases the mobility slightly but pulls the yield point down to approximately half that of water. The suspension in benzene does not show a linear relationship but the fluidity is even less than that of alcohol. The effect of small amounts of addition agents to aqueous suspensions is seen from Figures 5, 6 and 7, each of which was constructed from a large number of lines similar to those of Figure 3. The mud of Figure 7 is not identical with that of Figures 5 and 6.

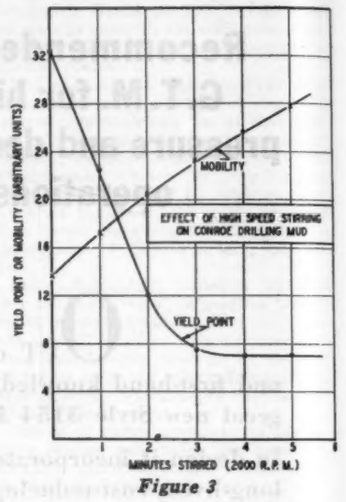
YIELD POINT OR MOBILITY (ARBITRARY UNITS)
MOBILITY
EFFECT OF HIGH SPEED STIRRING ON CONROE DRILLING MUD
YIELD POINT
MINUTES STIRRED (2000 R.P.M.)

Figure 3

The problem in hand is to develop the clearest practical picture of the underlying causes of these relationships.

Einstein Equation

Mathematical analysis shows that the viscosity of a dilute suspension of rigid, spherical particles, uniform in size, is given by the Einstein equation, $\mu = \mu_0 (1 + 0.5\,v)/(1-v)^2$, in which "$\mu_0$" is the viscosity of the liquid in which the particles are suspended, "μ" the viscosity of the suspension, and "v" the volume fraction of the suspended particles. The viscosity of the suspension is, as the equation indicates, independent of the size of the particles and rate of shear. The relationship has been carefully tested experimentally and is undoubtedly sound. Furthermore, the influence of variation in particle size in a given suspension is not great provided the fractional size distribution remains unchanged, and, while the equation breaks down at high values of "v" it still remains true that at these high values the viscosity is a unique function of the volume fraction.

There is no doubt that the high viscosity shown by ordinary suspensions is due solely to this Einstein effect, i.e., to the volumetric interference of the suspended particles with the movement of the liquid. Furthermore, the same is true of the viscosity of emulsions of one liquid in another; in other words, the interfering, suspended particles need not be rigid. The resistance to deformation of a small droplet caused by its surface tension is ample to give the effect.

There is every reason to believe that this same volumetric interference of suspended particles is the fundamental cause of the high viscosity exhibited by so-called colloidal solutions of many mate-

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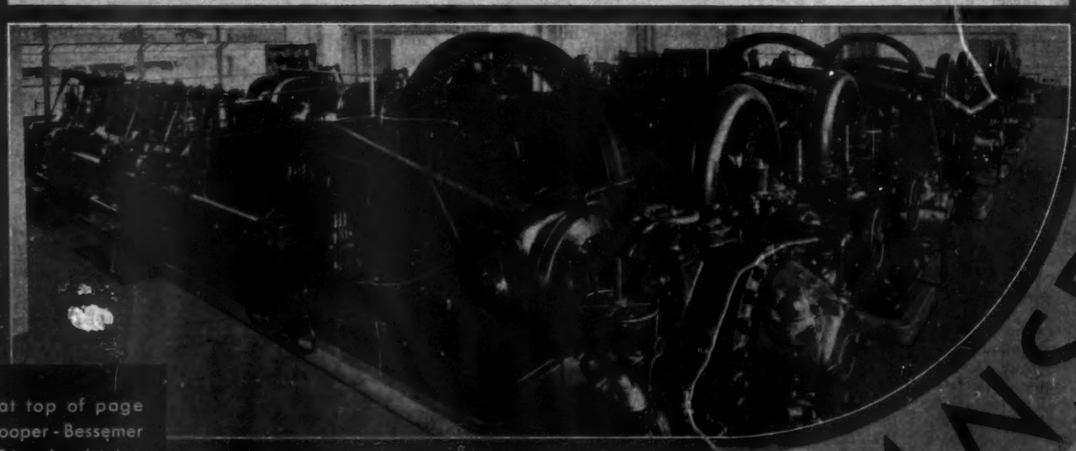

Photograph at top of page shows two Cooper-Bessemer Type FP-4 Diesels, driving crude oil pipe line pumps on a mid-western line.

The Northern Natural Gas Company chose two twin-tandem, 800 Horse Power compressor units for their new compressor station at Ogden, Iowa. The illustration just above shows three similar units in United Gas Company's Sarepta, La., station.

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rials of extremely high molecular weight, although in this case, as will appear later, other important factors enter into the phenomenon. Finally, it is important to recognize that, while the shape of the suspended particles has but little effect so long as their dimensions are roughly the same in all directions, rod-like or chain-like particles produce viscosity increases in excess of the solvent out of all proportion greater in relation to the volumetric fraction of the particles.

Assume a suspension in a given liquid of particles of definite, unchanging volume. From the preceding discussion it is clear that the viscosity should be constant, independent of rate of shear. Consequently, one is forced to the conclusion that in suspensions or colloidal solutions in which the relation between r.p.m. and torque is other than a straight line

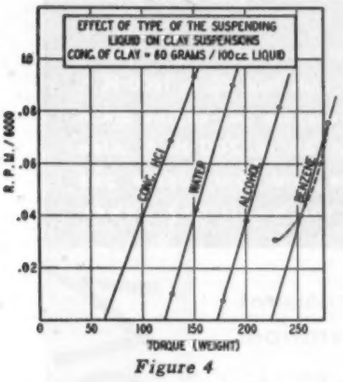

Figure 4

through the origin, some factor other than the volumetric interference of the suspended particles with liquid flow is playing a predominant part. These abnormalities in behavior can be explained only in the light of the knowledge of the surface characteristics of the particles and their interactions with each other.

Valence Forces

Study of the characteristics of liquids has led to the conclusion that molecules exhibit attractive forces which are enormous in magnitude in the immediate neighborhood of the molecular surface, but fade away with extreme rapidity as the distance from the surface increases. Furthermore, these attractions are undoubtedly electrical in character, of the nature of stray fields of electric force caused by incomplete neutralization of the electronic charges (e.g., of the valence forces) within the molecule. Their total effect in any given case is proportional to the amount of surface involved and to the intensity of the stray fields in the neighborhood of that surface. It thus becomes possible to understand the influence of molecular weight in boiling point. A molecule on the surface of a liquid is held there by the attractive forces under discussion. Clearly, the larger the molecule the greater the extent of its surface, and hence the greater the force holding it on the surface of the liquid. Its escaping tendency into the vapor is due predominantly to its kinetic vibrations, which in turn depend primarily on the temperature, uninfluenced by the structure or size of the molecule. Volatility is determined by the balance between these two sets of forces. Hence, as molecular weight and therefore molecular surface increases, volatility always decreases greatly. However, one must not ignore the intensity of the surface forces. Thus, water boils far higher than methane, despite almost identical molecular weights. This is because of the fact that the intensity of the fields of force around the methane molecule is low, whereas around the water molecule it is high. In other words, the former is inert and nonpolar, whereas the latter is active and highly polar. This point of view is fully confirmed by the chemical and physical characteristics of the two compounds. A similar approach offers a clear, qualitative explanation of the viscosity characteristics of pure liquids and of the behavior of liquids in general.

These attractive forces in the neighborhood of the molecular surface are capable of holding together not only similar, but also dissimilar molecules. Because of them there is undoubtedly a high degree of loose combination or association of the molecules of solvent and solute, particularly in the case of solutions in polar liquids. This is the phenomenon sometimes called solvation. It explains the well recognized hydration of electrolytes in aqueous solutions, is the cause of solvent of crystallization, and is probably the fundamental reason for the swelling of high molecular weight, amorphous solids in solvents. These forces also explain many of the phenomena of adsorption, such as gases on activated carbon, the concentration of materials of high molecular weight on the surfaces of liquids, the action of so-called protective colloids on the stability of suspensions and emulsions, and the like.

Clay Suspensions

These points of view place one in a position to explain many of the otherwise confusing characteristics of clay suspensions. The ultimate clay particles can be assumed to be excessively small flat plates. The water of chemical hydration is certainly present as hydroxyl groups, many, if not most, of which are on the external surface of the particle. The plates themselves probably consist at least in some degree of alternate layers of alumina and silica, bonded together

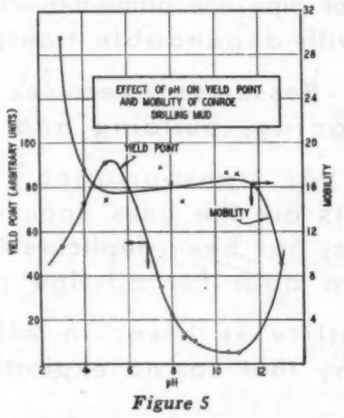

Figure 5

through oxygen valence bridges. Perhaps in certain clays the outer layers are silica and in others alumina, a difference which might explain some of the differences in behavior encountered. In any event, the hydroxyl groups on the surface of the particle possess two important characteristics: First, they are highly polar, i.e., around them exist strong fields of attractive force, and second, they are amphoteric, though predominantly acidic, i.e., their hydrogens are readily replaceable by metal. This is what is meant by the description of the particles as "clay acids." Thus, while clays contain predominantly silica, alumina and chemically combined water, various other metallic constituents are always found present. These are chiefly the alkali and alkaline earth metals, and sometimes small amounts of iron. That these constituents are not a fundamental part of the clay structure is shown by the fact that they can be removed or replaced by suitable treatment, leaving the clay particle practically unchanged. Thus, it is possible to remove the sodium and calcium by prolonging washing of the clay with strong mineral acid. Furthermore, by washing the clay with a strong salt solution, one can replace a large fraction of the calcium by sodium. This last phenomena, known as base exchange, is apparently a mass action effect, since the amount of metallic constituent replaced depends upon the concentration of the salt solution employed. As even clearer insight into these phenomena is obtained by producing a so-called acid clay, i.e., removing the sodium and calcium by treatment with strong acid, and then, after removing the excess of acid, titrating the suspended acid clay with alkali. The clay picks up alkali, as a weak, high molecular weight acid. In fact, the titration curve (equivalents of base added per unit weight of clay against the pH of the suspension) resembles that of a weak, dibasic acid; in this way one can determine the equivalent weight of the clay, the values ranging in the thousands.

Agglomerates

Because of the polar character of the surface radicals, the particles attract each other; because of the flatness of their surfaces, when the particles are located close together, face to face, the total attractive force between them is considerable and their aggregation correspondingly stable. Consequently, one can build up in the suspension relatively large and long agglomerates, consisting of a series of overlapping plates. These agglomerates in any event induce in the suspension an abnormally high viscosity in relation to the volume percentage of the particles present. Furthermore, if the aggregation goes far enough, it can build up in the suspension a "brush heap" structure sufficient to convert the suspension into a gel. On the other hand, these agglomerates are not so firmly held together that they cannot be disintegrated. This can be achieved even by mechanical means, indeed by the moderate agitation accompanying the determination of viscosity itself. This explains the general shape of the r.p.m.-torque curve, as, for example, in Curves 2, 3 and 4 of Figure 1. Violent agitation can break up the agglomerates quite completely, but a certain time is necessary for the disintegration. Once broken up, reagglomeration is slow because it can occur only as the particles, agitated in Brownian movement by the impacts of the solvent molecules around them, fortuitously arrange themselves in close promimity, face to face. However, this will in time occur, thus giving an explanation of the thixotropic properties of clay suspensions.

The behavior of a clay suspension depends, however, not only on the shape and the size of the particle but also on the character of the surface and the intensity of the surface forces. Because the surface is acidic, its hydrogens can be replaced by various metals, resulting in profound transformation of the surface character. The clay acids are excessively weak, i.e., the dissociation of the hydrogens extremely small, so that

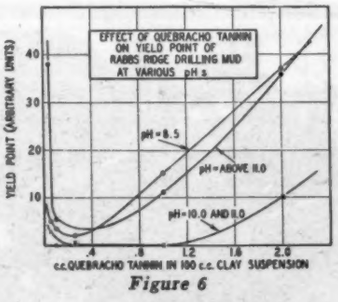

Figure 6

the uncombined surface consists of the highly polar hydroxyl groups, closely held. Consequently, the intensity of the surface attractions is high and particle agglomerates, once formed, extremely stable. This results in a high yield point.

If, however, the clay acid be allowed to react with metal, the hydrogen of the surface is replaced by metal ion. This ion, in analogy with the behavior of the salts of all weak acids, has a far greater tendency to dissociate than the hydrogen of the acid itself. In other words, the metal ion, while held relatively close to the face of the clay particle, is none the less much farther from the surface than the hydrogen ion which is replaced. Consequently, the surfaces of adjacent particles cannot approach as closely as before and are held together by correspondingly smaller forces. There is, therefore, less tendency for agglomerates to form and they are more readily disintegrated when formed. Hence yield point falls.

Furthermore, since the volumetric changes due to these changes in surface structure must be small in comparison with the total volume of the particles, the mobility, determined as it is predominantly by the volume per cent of the suspension, is relatively little affected. Consequently, the viscosity of the suspension drops greatly. If now, instead of adding base to raise the pH and replace the hydrogens, one adds strong mineral acid, one would expect the amphoteric clay surface to react as a base, again giving a decrease in yield point for reasons analogous to those discussed above. In other words, one would expect to find a maximum yield point and, furthermore, this maximum should be on the acid side of neutrality, i.e., at a pH considerably

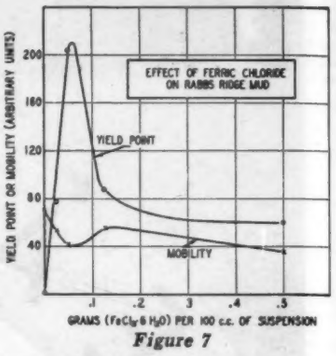

Figure 7

below 7, since the amphoteric clay is undoubtedly more acidic than basic.

That exactly this happens is clear from inspection of Figure 5, which shows a marked maximum in yield point at a pH of about 5. The rise in yield point at the right of the diagram may perhaps be due to depression of ionization in the extremely concentrated alkaline solutions in question. The reasons for mobility high in strongly acid solutions and low in strong alkalies is not clear.

Volume of Metallic Ion

However, one must consider also the nature of the metallic ion, particularly its valence. With increasing valence the average distance of the metal ion from the acid surface is greatly decreased.[1] This results in an increase in the intensity of the attractive forces and hence raises adhesion. This effect is

(Continued on Page 170)

[1]Consider the following analysis, which, though quantitative in form, is numerically only approximate. The metal ion capable of dissociation is undoubtedly driven away from the immediate neighborhood of the negative charge of the radical left on the surface of the clay predominantly by the impacts of surrounding water molecules. The kinetic theory indicates that the average magnitude of these impacts depends only on the temperature. The energy of impact will displace the ion a distance from the surface just sufficient to absorb the impact energy through the work done against the forces of electrostatic attraction pulling the ion back to the surface. Calling the intensity of this force, f, and the distance the ion moves, dL, the energy expended per ion against the attractive forces should be $w = \int f dL$. If "c" represents the valence of the ion, "a" the proportionality constant of Coulomb's law, and "b" the charge of a single electron, substituting and integrating $w = kc\left(\frac{1}{L_o} - \frac{1}{L}\right)$, where $k = ab$ and $f = ab/L^2$, and the distance of closest approach of the metal ion to the surface is L_o. The average distance of the metal ion from the surface is unknown, but for purposes of comparison assume it to be, in the case of a monovalent metal ion, four times the distance of closest approach, i.e., $L = 4L_o$. Substituting in the equation, $w/k = 3/4L_o$, whence the equation becomes $\frac{L_o}{L} = 1 - \frac{3}{4C}$. For a divalent ion, $C = 2$, $L = 8L_o/5$, and for a trivalent ion, $C = 3$, $L = 4L_o/3$. The average displacement from the closest position expressed in terms of the closest approach is $(L - L_o)/L_o$. For a monovalent metal ion this is 3; for a divalent, 0.6; and for a trivalent, 0.33. In other words, the displacement of a divalent ion from the surface is only one fifth that of the monovalent ion and this in turn only about one-half that of the trivalent. While the figures are certainly not quantitative, there is no reason to doubt their relative significance. Thus, these relationships are undoubtedly a predominant factor in causing the very low solubility of salts of the polyvalent-polyvalent type.

*"Says Dan Corcoran of the Black Gold Refining Co.: 'The survivor of the present economic storm * * * * will be the refiner able to get the greatest number of gallons of high grade oils from a barrel of crude * * * * as the packers use even the squeal of the pig * * * *'"*—DAILY OKLAHOMAN

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THE OIL AND GAS JOURNAL

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Traveling in Circles

Price fixing was the original panacea offered in the petroleum code and here it is back again. For sixteen months we have just been traveling in a circle!

But it indicates one happy conclusion—that the supply of rainbows has been exhausted since they are digging up the old ones.

Actually, the revival of the price fixing theory at this time is of special significance, being brought forward on the very eve of the long heralded general advance by all the forces of the Federal administration on East Texas.

If the Planning and Coordination Committee has any faith in this grand assault by the Federal forces ending "hot" oil what necessity is there for price fixing?

Or, are we to assume that the Committee has so little faith in the effectiveness of Federal effort that it is turning back in despair to the old nostrum?

Current developments support that supposition. Even those who have been hoping that Federal control over interstate shipments might work have about abandoned it.

The more that is seen of governmental interference in the oil industry or any business the less faith anyone can put in it.

It is amusing to find anyone amazed at the belated discovery of politics in government. That's what government is. That is why The Oil and Gas Journal has for years been warning against Federal control if the industry did not clean house.

Politicians know nothing, work at nothing but politics. If they are not fighting the other party they are planning and plotting to boost their own clique or faction or bureau all the time. Any business subjected to the control of politics is going to suffer accordingly. The best intentioned man in the world would be helpless in such an entanglement.

The experience of the oil industry has been just about what might have been expected. Politics is just one promise after another. There was a new bale of hay at the end of a stick ahead of every step. Finally the industry balked.

A last gigantic concerted effort was then announced. Every division and department of the administration was to be united in one great joint movement which, according to the advance notices, could not fail. What followed?

The Department of Justice lost two cases on the East Coast without the oil administration's evidence. A special assistant attorney general dispatched to East Texas with full authority decided to act when he "got good and ready", while the new executive assistant to the oil administrator, hurried to the field to start enforcement, simply urged the refiners to renew the gasoline buying program.

The Petroleum Administrative Board contact man in East Texas attempted to cajole reluctant refiners into signing buying contracts by adding a clause permitting them to retain their constitutional rights, which they could not be deprived of anyway.

A Federal tender board to pass upon all interstate shipments of crude and products from East Texas was set up at Kilgore, to begin functioning Wednesday, and preparations are already reported under way to seek an injunction against the board at the first opportunity.

Meanwhile the oil administration agents in East Texas have been "accumulating evidence" and waiting for the Department of Justice to prosecute, on the theory that while probably nearly all the cases might fail one or two might stick and be a moral example. On such a percentage basis the violators might conclude the odds justified continuing to take the risk.

This leaves the Treasury Department still to be heard from. Must it be concluded that "hot" oil producers and refiners are making truthful reports to the treasury and getting away with it? Was not this revenue tax the one sure method of cleaning up the field?

Perhaps the Treasury Department is not co-operating any better than the Department of Justice and the oil administration.

It is a pitiful picture of governmental self-entanglement. It is enough to dispel any hope ever entertained that a Federal administration might aid the industry solve its problems.

Contrast the self-government of the industry in Oklahoma and Kansas under state laws with the blundering bungling of Federal administration. Texas, now appealing for Federal regulation, despite its habitual demand for state's rights, could have averted all this by keeping its own production under control. An immediate appeal to Austin to advance the date for the state tender law would be more to the purpose.

If Texas fears the loss of hundreds of millions of dollars through a price reduction it has been warned often enough that the laws of supply and demand could not permanently be ignored.

That has been the basic folly of the experiment, the assumption that the fundamental facts established by experience could be waved aside while we tried to lift ourselves by our ears.

The oil producing states and the oil industry are now forced back to first principles. By reducing production to demand they can dispel the spectre of Federal control and return to sane operations.

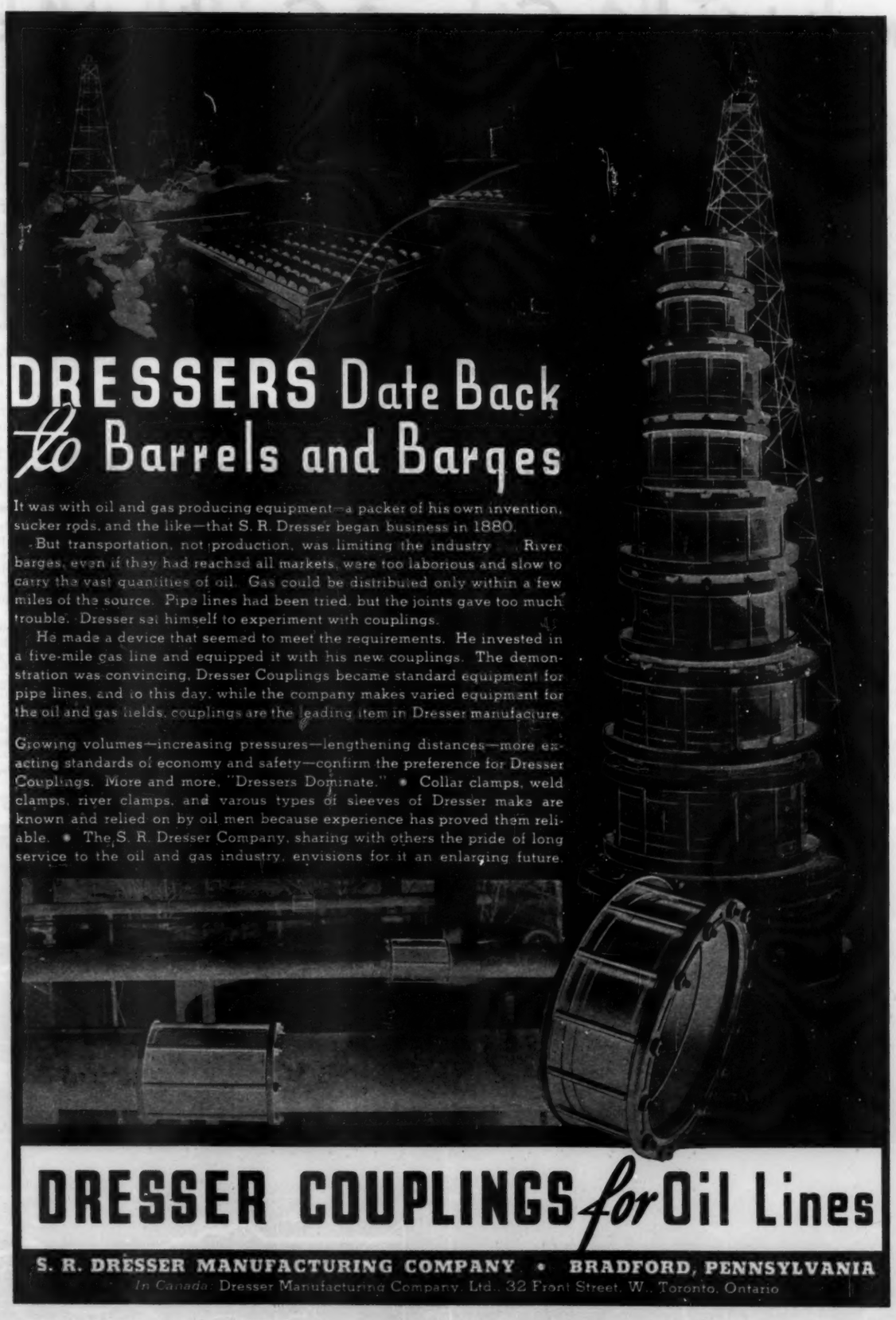
The wise and only solution is to return from wandering in the wilderness to the highway mapped by common sense. This is the constitutional course of interstate agreement on regulation, favored by the laws of the country and devoid of the pitfalls of Federal politics.

Deserves Re-election

When the American Petroleum Institute meets at Dallas next month it should assure itself of retaining the services of Axtell J. Byles as president. When Mr. Byles was chosen for the office at the Tulsa meeting in 1933 high expectations were entertained for his administration, expectations that have been more than realized although the period has been one of extreme difficulty for the industry.

Throughout the crowded year and a half that has intervened President Byles has guided the Institute skilfully and wisely. He has had the courage of his convictions and has dared to speak them boldly when necessity arose, the prime test of leadership.

If, as earnestly hoped, this experimental period is soon to end and the industry is to return to self-government, the experience and counsel of President Byles will be invaluable during the stage of transition. His unanimous re-election would demonstrate the solidity of the industry behind his leadership.



DRESSERS Date Back to Barrels and Barges

It was with oil and gas producing equipment—a packer of his own invention, sucker rods, and the like—that S. R. Dresser began business in 1880.

But transportation, not production, was limiting the industry. River barges, even if they had reached all markets, were too laborious and slow to carry the vast quantities of oil. Gas could be distributed only within a few miles of the source. Pipe lines had been tried, but the joints gave too much trouble. Dresser set himself to experiment with couplings.

He made a device that seemed to meet the requirements. He invested in a five-mile gas line and equipped it with his new couplings. The demonstration was convincing. Dresser Couplings became standard equipment for pipe lines, and to this day, while the company makes varied equipment for the oil and gas fields, couplings are the leading item in Dresser manufacture.

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Crude Price Cut by One Company Injects Fresh Uncertainty Into Group 3 Gasoline Market

By T. F. SMILEY

Gasoline, already the football of divers interests, rumors, price wars and uplift programs in the Oklahoma (Group 3) market, found itself the subject of fresh uncertainties Tuesday of this week, when the Atlas Pipe Line Co. announced it would pay 60 cents for East Texas crude, instead of $1, as formerly. This action brought the question of crude prices into the immediate foreground.

It had been believed no crude price cuts would be made until after the November elections, if at all, and one definite proposal to cut prices is said to have failed of execution through the intervention of Secretary Ickes.

Subject of Lively Discussion

The significance of the step taken by the Atlas, a small buyer, was a subject of lively discussion. Opinions varied. Some predicted other buyers would fall into line. Others were disposed to interpret the company's action as a challenge to the Government to take whatever measures it may to clean up the situation in East Texas. It was recognized that any general movement toward lowering crude prices would result in a collapse of the refined market.

Until news of the Atlas company's action was circulated, gasoline prices were showing a half-hearted disposition to stiffen. One thing that helped was the announcement that beginning Tuesday of this week the Federal oil administration would require that petroleum products to be shipped out of East Texas in interstate commerce must be accompanied by a Federal tender certifying to their having been made from legally produced crude.

Another mildly bracing influence lay in efforts to fan the gasoline purchasing program back to life. The East Texas Refiners Association was reported to have obtained agreements from about 90 per cent (in point of capacity) of the independent refiners in East Texas to sell their gasoline under the contracts which were in use when the plan was suspended a month ago.

While there seems to have been relatively little difficulty in getting most of the East Texas refiners to agree to sell under the buying plan, there remained the task of persuading the majors to buy under it. The experience of the majors in recent weeks has not been calculated to make them get in each other's way in their haste to enter new buying agreements.

It is understood the majors are in no mood to renew any promises to buy under a fixed plan until there is clear evidence that the regulations concerning the production of oil are to be enforced. Incidentally, it is pointed out that if law violations in crude production really were stopped there would be no need of a buying program in order to get a reasonable price for gasoline. The very reduction in gasoline output which would follow the drying up of hot oil would automatically raise the price of gasoline.

Stocks on Hand Made From Hot Oil

One of the situations creating comment in connection with the week's developments rests on the fact that substantial stocks of motor fuel now awaiting disposition in East Texas were made from hot oil. In the event of revivifying the purchasing plan the unlawful character of this gasoline apparently would have to be winked at if it were to be taken off the refiners' hands. And if the Federal tender order should be in effect it is not clear what species of legerdemain would be invoked in the event of an effort to ship this material in interstate commerce.

A report that L. R. Martineau, special agent of the U. S. Government, would arrive in East Texas Tuesday of this week and begin vigorous prosecution of law violators imparted no thrill. Promises of vigorous prosecution have lost their novelty.

U. S. Motor low-octane gasoline was commanding an eighth-cent more than it did the week before, and the regular grade showed a slightly better tone, but the moderate optimism that caused this upward trend was beginning to fade Tuesday and demand was tapering off. It was reported many East Texas refiners were accepting no new orders, owing to the uncertainties that faced them.

Natural Gasoline Softer

Natural gasoline demand exhibited no marked falling off, but prices softened slightly, partly, it was believed, because of uncertainties overhanging the refined market. The 26-70 and 18-55 grades underwent a price-shading of about an eighth-cent.

Heating oils, although prices managed to hold, were in little demand owing to the protracted mild weather throughout most of the country.

Gas-oils for cracking purposes experienced a slight firming, with prices stiffening. East Texas was reported virtually cleaned out of this material.

Lubricants were somewhat unsettled, although satisfactory movement was reported. Wax was strong.

Refined Oil Market Barometer

Gasoline market shaky owing to various uncertainties overhanging it, chief among these being the possibility of general crude cuts. Retail price wars reported in various areas. Feeling prevailed that if the Government had within its reach any method by which it could really stop law violations in East Texas and thus prevent a market collapse the time had come for it to act. Natural gasoline somewhat softer in sympathy with the disturbed straightrun market. Spell of cold weather needed to infuse life into the heating oils. Seasonal influences felt in other products.

Mid-Continent—Gasoline unsettled, with retail price-cutting in some districts. Naturals less firm. Kerosene and heating oils off.

East Coast—New all-time lows touched in local gasoline price wars. Steam-refined and bright stocks weak. Fuels slow.

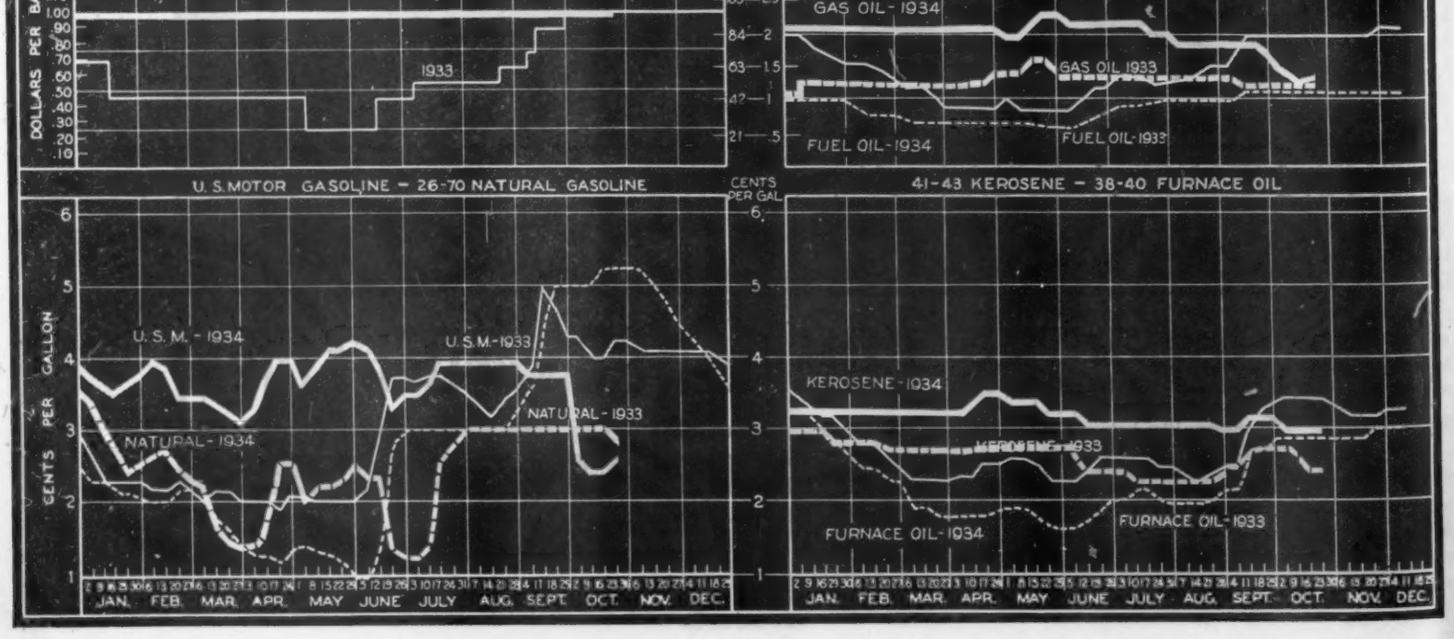
Gulf Coast—Gasoline offerings tighter, but situation weak, with price wars on third grade material general. Quotations on other products generally unchanged, but unsettled.

Pennsylvania—Gasoline weaker. Low-pour-test materials up, higher off, owing to cold-weather requirements.

California—General market firm, with prices unchanged. Gasoline and kerosene demand strong, owing to heavy off-shore shipments. Natural firming.

Chicago—Gasoline a trifle firmer, but market watching East Texas developments. Heating oils spotty. Naphthas quiet.

Representative Mid-Continent Quotations on Crude Oil and Refined Products Basis Oklahoma (Group 3)


36 GR. MIDCONTINENT CRUDE
DOLLARS PER BARREL
1934
1933
CENTS PER BBL. GAL
18 GR. FUEL OIL - U.G.I. GAS OIL
GAS OIL - 1934
GAS OIL 1933
FUEL OIL - 1934
FUEL OIL - 1933
U. S. MOTOR GASOLINE - 26-70 NATURAL GASOLINE
CENTS PER GALLON
U. S. M. - 1934
U. S. M. - 1933
NATURAL - 1934
NATURAL - 1933
CENTS PER GAL
41-43 KEROSENE - 38-40 FURNACE OIL
KEROSENE - 1934
KEROSENE - 1933
FURNACE OIL - 1934
FURNACE OIL - 1933
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

Local Price Wars Are Increasing on East Coast and Retail Prices Touching All Time Lows

By C. O. WILLSON
New York Bureau, The Oil and Gas Journal

NEW YORK, Oct. 22.—The chaotic condition in the gasoline market which has been apparent at many points in this territory since early in the month continued over the past week. The "local price wars" increased in number and intensity with retail prices, exclusive of taxes, dropping to all time lows at several points, including important consuming centers.

As an example of the ridiculous levels to which prices dropped last week in the daily battle of prices between small and large distributors, the retail quotation for the third grade gasoline of several major companies at Newark, N. J., dropped to 8.4 cents per gallon, including the 3-cent state and 1-cent Federal taxes, or a net of 4.4 cents. The regular branded grades of these major companies were only one-half to 1 cent per gallon higher. At Camden, N. J., across the river from Philadelphia, a similar situation prevailed with the regular grade of the independent dealers selling as low as 7½ cents per gallon, including 4-cent taxes, with the major companies selling their third grade at a net of 5 cents per gallon.

These extremely low prices, exclusive of taxes, are below the lowest quotations at seaboard points for gasoline in tank car lots. Where the companies guarantee the jobbers or dealers or both certain margins ranging from 4 to 6½ cents per gallon, the net back on the tank car market is nil. In a strict interpretation of some contracts, the refiners would be forced to pay the jobbers or dealers for handling their gasoline. As usual under such conditions, daily charges and counter charges between the so-called major group and the independent operators are heard, the latter claiming that the collapse in gasoline prices has been brought about by the former for the purpose of running them out of business.

Retail consumers flock to the points with the lowest prices and this shift in gallonage tends to jeopardize the markets in adjoining sections where an attempt is being made to maintain normal schedules. It is felt that if this condition continues it will result in further general reductions in all gasoline markets extending from the refineries to the service stations.

Replying to charges that the larger companies were attempting to run the smaller independents out of business, W. C. Teagle, president of the Standard Oil Co. (New Jersey), in an official statement last week denied the charges and placed the blame on the production of "hot" oil in the Mid-Continent Field, gasoline from which has been brought around to the East Coast and sold to jobbers who in turn have made price concessions to dealers and consumers.

"In many localities our marketing companies' retail stations and our dealers were being undersold by these cut-price competitors by from 1.5 to 4 cents or more a gallon," Mr. Teagle said. "This situation finally became so widespread that we had no alternative but to let our retail market go down to a point where there is real competition between our gasoline and that sold through these cut-price outlets with due allowances to the difference in quality. We have not reduced the price of gasoline below competitors' prices. We have followed the competitors' price down by reducing the differential between the posted retail price of our gasoline and the price named by the cut-price competitor.

"This policy of reducing the differential to meet the competitive prices is justified in behalf of our retail customers and friends of long standing; in behalf of our dealers and in our own interest. If we are to remain in business as a marketer of gasoline, no other course was left open to us. We desire a stable gasoline market, but this does not mean that we can continue to ask our retail customers to permanently pay such a substantial differential above the price named by these cut-price operators."

Reduce Differentials

This statement coming from the largest distributor in what is known as the Standard of New Jersey territory, and similar views by executives of other companies, indicate that the major organizations do not expect to recede from their position of narrowing the differentials existing between the prices charged consumers for their products and those of the independent operators. Starting with the beginning of the oil code over a year ago, many operators of tank car stations and other cut-price stations have contended they should be allowed to sell below the prices charged by the major companies. While no general approval of this contention has ever been given, in certain sections the larger companies agreed to try out the plan and these cut-price operators were allowed to undersell their large competitors from one-half to 1½ cents per gallon in retail sales. As a basis for their position the cut-price operators contended their costs were lower because they did not advertise their products, had small investments in station facilities and did not attempt to attract customers with many of the other costly appurtenances common to the operations of their major competitors.

The developments of the past few months in retail markets not only in this territory but in other sections apparently are proof of the weakness of this position from the standpoint of the major companies. They cannot permit these differentials in prices without losing gallonage, which in turn means increased costs for them per gallon sold, which obviously strengthens the competitive position of the independent cut-price operator.

Recent developments, therefore, are interpreted to mean a return to the policy on the part of major companies of meeting competition on an equal price basis with the use of a third grade gasoline where necessary and with a narrowing of spreads between third grade and regular grade products. There is no indication at this time that the government will interfere with the carrying out of this policy.

Tax Evasion

In addition to the reductions in posted retail prices there are reports in the trade that rebates and other forms of secret price cutting have been prevalent in this market for several months. There is also the more serious charge that price cutting, in a few cases at least, has been brought about by the evasion of Federal or state gasoline taxes or both. In New Jersey, where the market situation is more critical than any other, it is pointed out the gasoline tax collections so far this year have been running behind last year despite the fact all the other states in this section have shown increases. New Jersey had trouble in gasoline tax collections four years ago and a new law was passed which was aimed to plug the holes in the initial legislation. If certain jobbing interests are able to evade gasoline taxes ranging from 3 to 4 cents per gallon, the marketing situation in New Jersey is hopeless from the standpoint of the legitimate operators. Reports indicate this phase of the market situation will receive consideration in the efforts being made to bring a return to normal marketing conditions to that State.

Prices

The prices posted at representative Atlantic Seaboard points for gasoline in tank car lots at this writing were unchanged from last week. A week ago it was predicted these prices would decline an additional 1 cent. Later in the week it was thought further price reductions might await the efforts now being made at Washington to prevent general reductions in posted crude oil schedules, which if they materialize probably will mean lower base gasoline prices in the Mid-Continent and the Gulf Coast. The prices in New York harbor as posted by the larger refiners ranged from 5¼ cents for low octane U. S. Motor to 6 cents for the regular branded grades containing Ethyl fluid. The demand for gasoline was slow and it was claimed that low octane material was offered at 5 cents.

There were no important price changes in kerosene, furnace oils, gas oil and fuel oils. Reflecting the general uncertainty in the oil business, spot buying and movement on contract was slow, buyers postponing purchases as much as possible in expectation of lower prices. While the actual consumption of furnace oil and some other grades of fuels is showing a seasonal increase the refinery demand is slow due to the fact jobbers and other buyers are not accumulating their usual storage.

The steam refined and bright stock market continues weak. Prices on some grades of both Pennsylvania and western stocks are slightly lower. The weakness in bright stocks centers in the high cold test grades. Neutral oils are firm. Trading continues active in crude scale wax with no changes in quotations for the refined grades.

American Petroleum Institute Weekly Refinery Statistics

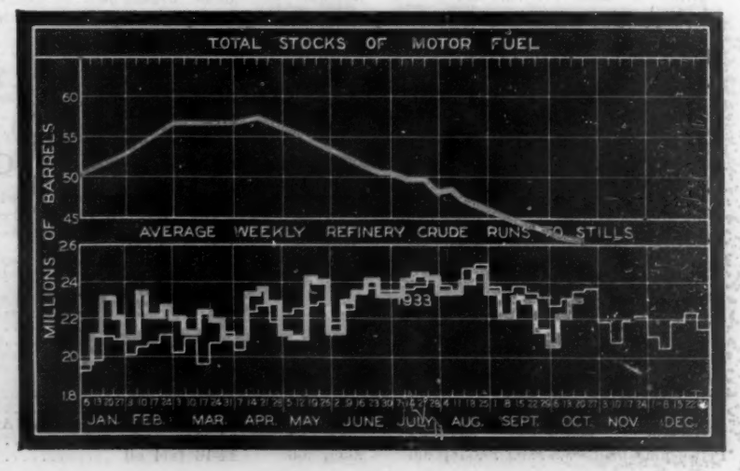
WEEK ENDING OCTOBER 20, 1934

	Capacity reporting per cent	Daily crude runs (bbls.)	Finished motor fuel (bbls.)	Gas oil and fuel oil (bbls.)
East Coast	100.0	499,000	13,002,000	14,647,000
Appalachian	93.3	96,000	1,618,000	1,731,000
Indiana, Illinois, Kentucky	94.6	356,000	6,615,000	5,387,000
Oklahoma, Kansas, Missouri	83.7	229,000	3,811,000	3,806,000
Inland Texas	47.6	93,000	903,000	1,465,000
Texas Gulf	97.5	440,000	3,909,000	10,201,000
Louisiana Gulf	96.4	115,000	1,379,000	3,306,000
North Louisiana and Arkansas	83.7	50,000	289,000	573,000
Rocky Mountain	66.7	41,000	462,000	531,000
California	96.9	406,000	10,965,000	73,521,000
Total United States	89.7	2,325,000	42,953,000	115,168,000

WEEK ENDING OCTOBER 13, 1934

East Coast	100.0	461,000	13,013,000	14,516,000
Appalachian	93.3	102,000	1,568,000	1,656,000
Indiana, Illinois, Kentucky	94.6	331,000	6,405,000	5,184,000
Oklahoma, Kansas, Missouri	83.7	220,000	3,917,000	3,771,000
Inland Texas	47.6	99,000	901,000	1,442,000
Texas Gulf	97.5	446,000	3,987,000	10,493,000
Louisiana Gulf	96.4	112,000	1,176,000	3,176,000
North Louisiana and Arkansas	83.7	44,000	278,000	572,000
Rocky Mountain	66.7	38,000	462,000	523,000
California	96.9	405,000	11,407,000	73,990,000
Total U. S.	89.7	2,267,000	43,109,000	115,317,000

Note: Finished motor stocks shown in graph and in table include those at refineries, at bulk terminals and in pipe lines, but do not include 5,000,000 to 7,000,000 bbls. of unfinished gasoline which could be reprocessed quickly.



REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement except as otherwise noted

The following quotations are exclusive of the Federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

Refinery Gasolines

	Oct. 23		Oct. 16	
OKLAHOMA (Group 3)—				
U. S. Motor grades:				
Below 63 octane	.02⅝	.03	.02½	.03
63-70 octane	.03⅝	.04	.03⅝	.04
60-62 400 grades:				
Below 63 octane	.02¾	.03¼	.02⅝	.03¼
63-70 octane	.03⅝	.04	.03⅝	.04
64-66 375	.03½	.03¾	.03½	.03¾
68-70 360	.03⅝	.03⅞	.03⅝	.03⅞
NORTH TEXAS—				
U. S. Motor grades:				
Below 63 octane	.02⅞	.03	.02¾	.03
63-70 octane	.03¾	.04⅛	.03¾	.04⅛
60-62 400	.03	.03¼	.03	.03¼
64-66 375	.03⅝	.03⅞	.03⅝	.03⅞
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
U. S. Motor grades:				
Below 63 octane	.03	.03¼	.03	.03¼
63-70 octane	.04½	.04⅝	.04½	.04⅝
60-62 400	.03¼	.03½	.03¼	.03½
68-70 360	.04	.04⅛	.04	.04⅛
ARKANSAS (Ark., N. La. & Miss. del.)—				
U. S. Motor grades:				
Below 63 octane	.03	.04¼	.03	.04¼
63-70 octane	.04½	.04⅝	.04½	.04⅝
CHICAGO (based on Oklahoma Group 3)—				
U. S. Motor grades:				
Below 63 octane	.02⅝	.03	.02½	.03
63-70 octane	.04¼	.04½	.04¼	.04½
60-62 400	.02⅝	.03	.02⅝	.03
64-66 375	.03½	.04	.03½	.03¾
68-70 360	.03¾	.04	.03¾	.04
Aviation fighting grade	.04¾	.05	.04¾	.05
PENNSYLVANIA (inland refineries)—				
58-60 U. S. Motor:				
Below 60 octane	.05		.05½	.05⅝
60-64.9 octane	.06		.06⅛	.06¼
65-70 octane	.06⅝		.06½	.06⅝
68-70 350	.06⅛		.06	.06¼
CALIFORNIA (domestic movement)—				
54-58 U. S. Motor	.07	.08	.07	.08
58-60 400	.08	.09	.08	.09
EAST COAST—				
U. S. Motor, below 60 octane:				
*New York	.05¼		.05¼	
Baltimore	.05¼		.05¼	
U. S. Motor, 60-64 octane:				
*New York (Bayonne)	.05½		.05½	
Philadelphia	.05½	.05¾	.05½	.05¾
Boston	.04	.04½	.04	.04½
Baltimore	.05½		.05½	
Charleston, S. C.	.05½	.05¾	.05½	.05¾
U. S. Motor, 65 and above:				
*New York	.05¾		.05¾	
Philadelphia	.05¾	.06	.05¾	.06
Boston	.04½	.04¾	.04½	.04¾
Charleston, S. C.	.06		.06	

*All grades of gasoline one-fourth cent less for small barge shipments.

GULF COAST (domestic)—				
U. S. Motor:				
Below 60 octane	.04½		.04½	.04¾
60-64.9 octane	.04¾	.05	.04¾	.05¼
65 octane and higher	.05¼		.05¼	

Naphthas

	Oct. 23		Oct. 16	
PENNSYLVANIA (inland refineries)—				
50-52 (blending)	.04⅝		.05¼	.05¼
52-54 450 (blending)	.04⅝		.05⅛	.05¼
54-56 450 (blending)	.04⅝		.05⅛	.05¼
50-52 450 (blending)	.04⅝		.03¾	.03⅞
CHICAGO (based on Oklahoma Group 3)—				
50-52 450 (blending)	.03½	.03¾		
Cleaners' naphtha, 56-58 gr., 200 i.b.p.-320 e.p.	.06¾	.07	.06¾	.07
Lacquer diluent, 180 i.b.p.-250 e.p.	.07⅝	.08	.07¾	.08
Lacquer diluent, 140 i.b.p.-200 e.p.	.08¾	.09	.08¾	.09
Rubber solvent, 58-70 gr., 100 i.b.p.-300 e.p.	.06¾	.07	.06¾	.07
Stoddard solvent, 300 i.b.p.-410 e.p., over 83° flash	.06¼	.06½	.06¼	.06½
Pet. thinner, 290-300 i.b.p.-415 e.p., over 83° flash	.06¼	.06½	.06¼	.06½
V.M.&P. naphtha, 56-58 gr., 190-200 i.b.p.-330 e.p.	.06¾	.07	.06¾	.07
Petroleum spirits	.05¾	.06	.05¾	.06

Natural Gasolines

	Oct. 23		Oct. 16	
OKLAHOMA (Group 3)—				
Grade 26-70	.02⅞		.03	
Grade 18-55	.03⅜	.03½	.03½	
Low vapor pressure grades:				
14 lb. v.p. (max.)	.03¾		.03¾	
11 lb. v.p. (max.)	.04⅛	.04¼	.04⅛	.04¼
NORTH TEXAS—				
Grade 26-70	.02⅝	.02¾	.02¾	.02⅞
Grade 18-55	.03¼	.03⅜	.03⅜	.03½
Low vapor pressure grades:				
14 lb. v.p. (max.)	.03⅝	.03¾	.03⅝	.03¾
11 lb. v.p. (max.)			.04	
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
Grade 26-70	.03¼		.03⅜	
CALIFORNIA—				
75-85 375	.06½	.06¾	.06½	.06¾

Kerosenes

(All kerosenes water white)

	Oct. 23		Oct. 16	
OKLAHOMA (Group 3)—				
41-43	.03	.03½	.03	.03½
42-44	.03⅛	.03¼	.03⅛	.03¼
NORTH TEXAS—				
40-41	.02¾	.03	.02⅞	.03⅛
41-43	.02⅞	.03½	.03	.03¼
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
41-43	.03⅜		.03⅜	
ARKANSAS (Ark., N. La. & Miss. del.)—				
41-43	.03⅜	.03½	.03⅜	.03½
PENNSYLVANIA (inland refineries)—				
45	.04⅝		.04⅝	.04¾
46	.04¾		.04¾	.04⅞
47	.04⅞		.04⅞	.05
CHICAGO (based on Oklahoma Group 3)—				
41-43	.03	.03⅛	.03	.03⅛
42-44	.03⅛	.03⅜	.03¼	.03⅜
CALIFORNIA (Pacific Coast consumption)—				
38-40 high burning test	.04¾	.05¼	.04¾	.05¼
NEW YORK (Bayonne, N. J.)—				
41-43	.05	.05¼	.05	.05¼
GULF COAST (domestic)—				
41-43	.04½	.04⅝	.04½	.04⅝

Petroleum Coke

(Prices per ton f.o.b. refineries in Chicago area)
(Refineries will absorb freight to 80 cents a ton)

	Oct. 23	Oct. 16
Still run	5.75	5.75
Direct from still	6.75	6.75
Egg, nut, pea	8.25	8.25
Lump	8.25	8.25

Furnace Oils and Tractor Fuels

(Zero cold test under 190° flash and good odor)

	Oct. 23		Oct. 16	
OKLAHOMA (Group 3)—				
32-36 straw	.02½	.02¾	.02½	.02¾
36-38 straw	.02⅝	.02½	.02⅝	.02½
38-40 straw	.02½	.02⅝	.02½	.02⅝
38-40 prime white	.02⅝	.02¾	.02⅝	.02¾
NORTH TEXAS—				
38-40 straw	.02¼	.02⅝	.02½	.02⅝
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
36-40 furnace oil	.02½	.02¾	.02½	.02¾
ARKANSAS (Ark., N. La. & Miss. del.)—				
32-36 furnace oil	.02½	.02¾	.02½	.02¾
CHICAGO (based on Oklahoma Group 3)—				
32-36 straw	.02½	.02⅝	.02½	.02¾
38-40 straw	.02½	.02⅝	.02½	.02¾
38-40 prime white	.02⅝	.02¾	.02⅝	.02⅞
NEW YORK (Bayonne, N. J.)—				
36-40 (No. 1 grade)	.05	.05¼	.05	.05¼
32-36 (No. 2 grade)	.04½		.04½	
21 industrial (No. 4 grade)	.04½		.04½	

Gas Oil, Diesel Oil and Fuel Oil

(Gas oil per gallon; Diesel and fuel oils per barrel)

	Oct. 23		Oct. 16	
OKLAHOMA (Group 3)—				
32-36 gas oil cracking stock	.01¼	.01½	.01⅜	.01⅝
U.G.I. gas oil	.01⅜	.01½	.01¼	.01⅜
32-36, zero to 15 gas oil	.02⅜	.02⅝	.02⅜	.02⅝
28-30, No. 3 burner oil	.95	1.00	.95	1.00
26-30, zero to 10 fuel oil	.85	.95	.85	.95
24-26 fuel oil	.75	.80	.75	.80
20-22 fuel oil	.70	.72½	.70	.72½
Below 16 fuel oil	.60	.62½	.60	.62½
NORTH TEXAS—				
32-36 gas oil, industrial	.01⅛	.01⅜	.01⅛	.01⅜
22-26 fuel oil	.67½	.70	.67½	.70
Below 20 fuel oil	.57½	.62½	.57½	.62½
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
30-32 gas oil, zero	.02⅜	.02½	.02⅜	.02½
14-16 fuel oil	.70	.75	.70	.75
ARKANSAS (Ark., N. La. & Miss. del.)—				
30-32 gas oil, zero	.02⅜	.02½	.02⅜	.02½
32-36 gas oil	.02¼	.02⅜	.02¼	.02⅜
14-16 fuel oil	.70	.75	.70	.75
CHICAGO (based on Oklahoma Group 3)—				
32-36 gas oil, industrial	.01⅜	.01½	.01⅜	.01½
28-30 zero to 10, fuel oil	.95	1.00	.95	1.00
26-28 zero to 10, fuel oil	.85	.90	.85	.90
22-26 zero to 10, fuel oil	.75	.80	.75	.80
18-22 zero to 10, fuel oil	.62½	.65	.62½	.65
Below 18 fuel oil	.55	.60	.55	.60

Note: Fuel oils of more than 40 cold test generally 5 to 15 cents per barrel in all these areas.

PENNSYLVANIA (inland refineries)—				
36-40	.03⅞	.04	.03⅞	.04
CALIFORNIA—				
Los Angeles:				
30-34 gas oil per bbl.	1.10	1.26	1.10	1.26
27 plus Diesel	1.05	1.15	1.05	1.15
27 plus Diesel (bunkers)	1.13	1.20	1.13	1.20
12-16 (bunker at tidewater)	.82	.85	.82	.85
10-16 (cargo lots)	.66	.75	.66	.75
12-17 (tank cars)	.60	.80	.60	.80
San Joaquin Valley:				
10-18 (tank cars)	.55	.70	.55	.70
San Francisco:				
27 plus Diesel per bbl.	1.15	1.25	1.15	1.25
27 plus Diesel (bunkers)	1.19		1.19	
10-16 (bunkers)	.89		.89	
GULF COAST—				
28-30 gas oil	.03½	.03⅝	.03½	.03⅝
28-30 Diesel (bunkers)	1.70		1.70	
Bunker C (bulk cargoes)	.90	.95	.90	.95
Bunker C (bunkers)	1.00		1.00	
NEW YORK (Bayonne, N. J.)—				
27 plus, gas oil	.04½		.04½	
28-30 Diesel (lighterage 6½ cents per bbl.)	1.89		1.89	
28-30 Diesel (tank cars)	.04¼		.04¼	
*Bunker C (to ocean-going ships in N. Y. harbor)	1.15		1.15	

*Lighterage charge 5 cents per barrel additional.

Neutral Oils

(Vis. at 100° F. except Pennsylvania, and color N.P.A.)

OKLAHOMA (Group 3)—	Oct. 23		Oct. 16	
Zero to 10 Cold Test:				
150-3	.10		.10	
180-3	.11¼		.11¼	
180-4	.10¾		.10¾	
200-3	.11¾		.11¾	
200-4	.11¼		.11¼	
240-3	.13¾		.13¾	
240-4	.13¼		.13¼	
280-3	.14¾		.14¾	
280-4	.14		.14	
300-3½	.15¼		.15¼	
400-4	.17¼		.17¼	
100-2 paraffin oil	.05¾		.05¾	
15-20 Cold Test:				
200-3	.10¾		.10¾	
200-4	.10¼		.10¼	
240-3	.12¾		.12¾	
240-4	.12¼		.12¼	
280-3	.13¾		.13¾	
280-4	.13		.13	
GULF COAST—				
Pale Oils:				
200-3	.07½	.08	.07½	.08
300-3	.08	.08½	.08	.08½
500-3½	.09	.09½	.09	.09½
750-3½	.09½	.10	.09½	.10
1,200-3½	.10	.10½	.10	.10½
2,000-4	.10¼	.10¾	.10¼	.10¾
Red Oils:				
200-5-6	.07¼	.07½	.07¼	.07½
300-5-6	.07¾	.08	.07¾	.08
500-5-6	.08½	.09	.08½	.09
750	.09	.09½	.09	.09½
1,200-5-6	.09¾	.10	.09¾	.10
CALIFORNIA—				
Pale Oils:				
100-2½-3	.12½	.14½	.12½	.14½
200-2½-3	.12½	.14½	.12½	.14½
300-3-3½	.12½	.14½	.12½	.14½
350-3-4	.12½	.14½	.12½	.14½
400-3-4	.12½	.14½	.12½	.14½
450-3-4	.12½	.14½	.12½	.14½
550-3-4	.12½	.14½	.12½	.14½
600-3-4	.12½	.14½	.12½	.14½
Red Oils:				
200-4-5	.12½	.14½	.12½	.14½
300-5-6	.12½	.14½	.12½	.14½
350-5-6	.12½	.14½	.12½	.14½

400-5-6	.12½	.14½	.12½	.14½
450-5-6	.12½	.14½	.12½	.14½
500-5-6	.12½	.14½	.12½	.14½
600-5-6½	.12½	.14½	.12½	.14½
700-6½ plus	.12½	.14½	.12½	.14½
750-6½ plus	.12½	.14½	.12½	.14½
900-6½ plus	.12½	.14½	.12½	.14½
PENNSYLVANIA—				
150 vis. at 70° F., 3 color, 400-405 flash:				
Zero pour test	.23½	.24	.23½	.24
10 pour test	.22½	.23	.22½	.23
15 pour test	.22	.22½	.22	.22½
25 pour test	.21	.21½	.21	.21½
180 vis. at 70° F., 3 color:				
25 pour test	.24½	.25	.24½	.25
200 vis. at 70° F., 3 color:				
Zero pour test	.30	.30½	.30	.30½
10 pour test	.29	.29½	.29	.29½
15 pour test	.28½	.29	.28½	.29
25 pour test	.27½	.28	.27½	.28

Bright and Steam Refined Stocks

OKLAHOMA (Group 3)—	Oct. 23		Oct. 16	
Bright Stocks:				
190-200 D	.19		.19	
150-160 D, 0-10	.16		.16	
150-160 D, 10-25	.15½		.15½	
150-160 24-40	.15		.15	
150-160 E	.15		.15	
Steam refined:				
630 light green (treated)	.13		.13	
600 light green (untreated)	.06	.08	.06	.08
600 dark green (untreated)	.04½	.07	.04½	.07
PENNSYLVANIA—				
Bright Stocks (Pennsylvania grade, No. 8 color, 145-50 at 210; 540-550 flash):				
10 pour test	.22	.22½	.22	.22½
15 pour test	.21½	.22	.21½	.22
20 pour test	.21	.21½	.21	.21½
25 pour test	.18	.20	.18	.19½
Steam refined:				
600	.09½	.10½	.10	.11
650	.13	.13½	.13	.13½
600 Pennsylvania flash	.14	.14½	.14	.14½
630 flash	.18	.18½	.18½	.19
600 Warren E filtered	.14	.14½	.14	.14½

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—	Oct. 23		Oct. 16	
124-126 white crude scale	.03½	.03⅝	.03½	.03⅝
PENNSYLVANIA—				
122-124	.0325	.0330	.0325	
124-126	.0330	.0335	.0325	
NEW YORK—				
Wax (a.m.p.) in bags fully refined:				
120-122	.0420	.0430	.0420	.0430
123-125	.0440	.0460	.0440	.0460
125-127	.0445	.0470	.0445	.0470
130-132	.05	.0510	.05	.0510
133-135	.0545	.0570	.0545	.0570
135-137	.0570	.0595	.0570	.0595
124-126 crude scale	.03¼		.03	.03⅛
Petrolatum in barrels in carload lots:				
Dark green	.01⅞		.01⅞	
Amber	.02⅞	.03	.02⅞	.03
Extra amber	.03	.03⅛	.03	.03⅛
Lily white	.06⅝	.06¾	.06⅝	.06¾
Snow white	.07¾	.07⅞	.07¾	.07⅞
Cream	.05⅝	.05¾	.05⅝	.05¾
CHICAGO (f.o.b. switching district)*—				
122-124 wax	.0490	.0500	.0490	.0500
125-127 wax	.0515	.0525	.0515	.0525
127-129 wax	.0530	.0540	.0530	.0540
130-132 wax	.0590	.0600	.0590	.0600
132-134 wax	.0615	.0625	.0615	.0625

*Cents per pound on carlot orders in burlap bags of 225 lbs. approx. Add 3° F. a.m.p.

Export Prices

GASOLINE

GULF COAST—	Oct. 23	Oct. 16
U. S. Motor	.03¾	.04¼

60-62 400	.03⅞		.04⅜	
61-63 390	.04	.04⅛	.04½	
64-66 375	.04¼		.04⅝	
LOS ANGELES, CALIF.—				
U. S. Motor grades:				
53-55 octane	.04	.04¼	.04	.04¼
55-65 octane	.04¼	.04½	.04¼	.04½
65-67 octane	.04½	.04¾	.04½	.04¾
67-69 octane	.04¾	.05	.04¾	.05
Above 69 octane	.05	.05¼	.05	.05¼
58-60 400 endpoint	.04¾	.05½	.04¾	.05½

KEROSENE

GULF COAST—				
41-43 prime white	.03⅞		.04	.04⅛
41-43 water white	.04		.04⅛	.04¼
44 water white	.04⅛		.04¼	.04⅜
LOS ANGELES, CALIF.—				
41-43 water white	.04¼	.04¾	.04¼	.04¾

LUBRICANTS

NEW YORK (f.a.s. in bbls.)—				
Cylinder Stocks:				
600 Warren E	.21½	.22	.21½	.22
600 S.R. unfiltered	.17	.18	.17½	.18
650 S.R. unfiltered	.18½	.19	.18½	.19
600 flash S.R.	.19	.19½	.19	.19½
630 flash S.R.	.25	.25½	.25	.25½
Bright Stocks:				
8 color	.25½	.26½	.26	.27
6½ plus color, in dilution	.24½	.25	.25	.26

NEUTRAL OILS

200-3 color	.34	.35	.34	.35
150-3 color	.27	.28	.27	.28

PARAFFIN WAX (Full Refined)

NEW YORK (prices per pound)—				
120-122 a.m.p.	.0405	.0425	.0405	.0425
123-125 a.m.p.	.0435	.0455	.0435	.0455
125-127 a.m.p.	.0440	.0465	.0440	.0465
128-130 a.m.p.	.04¾	.0490	.04¾	.0490
130-132 a.m.p.	.0495	.0505	.0495	.0505
133-135 a.m.p.	.0540	.0565	.0540	.0565
135-137 a.m.p.	.0565	.0590	.0565	.0590

Crude Oil Gravity Table

Gravity—	Oklahoma and Kansas 1	North Texas, Central Texas and East Central Texas 2	North Louisiana and Arkansas 3	Gray County, Texas 4	Carson, Hutchinson and Moore Counties, Texas 5	Conroe, Texas 6	Salt Creek, Wyo. 7	Gulf Coast, Texas and Louisiana 8	Gulf Coast, Texas and Louisiana 9	Cotton Valley, Louisiana 10
Below 20	....	....	....	....	....	....	....	$.82	$.82	....
20-20.9	....	....	....	....	....	....	....	.84	.84	....
21-21.9	....	....	....	....	....	....	....	.86	.86	....
22-22.9	....	....	....	....	....	....	....	.88	.88	....
23-23.9	....	....	....	....	....	....	....	.90	.90	....
24-24.9	....	....	....	....	....	....	....	.92	.92	....
Below 25	*$.76	....	....	....	....	....	....	....	....	$.70
25-25.9	*.78	....	....	....	....	....	....	.94	.94	72
26-26.9	*.80	....	....	....	....	....	....	.96	.96	.74
27-27.9	*.82	....	....	....	....	....	....	.98	.98	.76
28-28.9	*.84	....	....	....	....	....	....	1 00	1.00	.78
Below 29	84	$.79	$.79	....	....	....	$.84	....	....	....
29-29.9	.86	.81	.81	....	....	....	.86	1 02	1.02	.80
30-30.9	.88	.83	.83	....	....	....	.88	1.04	1.04	.82
31-31.9	.90	.85	.85	....	....	....	.90	1.06	1.05	.84
32-32.9	.92	.87	.87	....	....	....	.92	1.08	1.06	.86
33-33.9	.94	.89	.89	....	....	....	.94	1.10	1.07	.88
34-34.9	.96	.91	.91	....	....	....	.96	1.12	1.08	.90
Below 35	....	....	....	$.79	$.69	....	....	....	....	....
35-35.9	.98	.93	.93	.81	.71	$1.09	.98	1.12	1.09	.92
36-36.9	1.00	.95	.95	.83	.73	1.11	1 00	1.12	1.10	.94
37-37.9	1.02	.97	.97	.85	.75	1.13	1.02	1.12	1.11	.96
38-38.9	1.04	.99	.99	.87	.77	1.15	1.04	1.12	1.12	.98
39-39.9	1.06	1.01	1.01	.89	.79	1.17	1.06	1 12	1.13	1.00
40 and over	1.08	1.03	1.03	.91	.81	1.19	1.08	1.12	1.14	1 02

Note—Effective June 1, 1934, Texas Co. purchases Texas Panhandle crude on a sweet crude and sour crude basis. Panhandle sweet crude is paid for on a basis of the Gray County prices posted above, and Panhandle sour crude is paid for on a basis of Carson and Hutchinson County prices posted above.

*The following companies purchasing crude oil in Kansas or Oklahoma, or both, begin their price schedule: Below 25°, 76 cents; 25-25.9°, 78 cents, with 2 cents added for each degree upward to 40 and over at $1.08; Carter Oil Co., Magnolia Petroleum Co., Pure Oil Co., Rock Island Refining Co., Shell Petroleum Corp., Sinclair Prairie Oil Marketing Co., Skelly Oil Co., and Wilcox Oil & Gas Co. All others begin their schedules at below 29°, 84 cents, excepting Phiitex Oil Co., which begins with below 31° at 88 cents.

Column 1—Effective September 29, Texas Co. of Oklahoma; Stanolind Crude Oil Purchasing Co. in Kansas and Oklahoma; Anderson & Prichard, Inc., in Oklahoma; Bell Oil & Gas Co. in Oklahoma; Carter Oil Co. in Oklahoma and Kansas; Deep Rock Oil Co. in Oklahoma; Derby Oil Co. in Kansas; Globe Refining Co. in Oklahoma; Golden Rule Refining Co. in Kansas; Gypsy Oil Co. in Oklahoma and Kansas; Kanotex Refining Co. in Kansas; Magnolia Petroleum Co. in Oklahoma; Mid-Continent Petroleum Corp. in Oklahoma; National Refining Co. in Kansas and Oklahoma:; Shell Petroleum Corp. in Kansas and Oklahoma; Sinclair Prairie Oil Marketing Co. in Kansas and Oklahoma; Texas Co. in Oklahoma; Tide Water Oil Co. in Oklahoma; Vickers Refining Co. in Kansas; Continental Oil Co. in Kansas and Oklahoma; Empire Pipe Line Co. in Oklahoma and Kansas; Phiitex Oil Co. in Kansas and Oklahoma; Pure Oil Co. in Oklahoma; Skelly Oil Co. in Kansas. Effective September 29, by White Eagle Oil Corp. in Kansas; October 1 by Barnsdall Refineries, Inc., in Oklahoma.

Column 2—Effective September 29, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Bell Oil & Gas Co., Continental Oil Co. Effective September 29, in the Van Pool, Van Zandt County, Pure Oil Co. posted below 29°, 84 cents, with 2 cents added for each degree up to 40 and over at $1.08.

Column 3—Effective September 29, by Texas Co., Magnolia Petroleum Co., Gulf Refining Co. Effective December 22, Stanolind Oil & Gas Co. in Pine Island, Louisiana, and Marion County, Texas, posted below 29°, 79 cents, with 2 cents added for each degree up to 40 and over at $1.03. Effective March 17, 1934, by Standard Oil Co. of Louisiana and Louisiana Oil Refining Co. Starting with below 25°, 71 cents, adding 2 cents for each degree upward to 40 and over at $1.03.

Column 4—Effective September 29, by Texas Co., Humble Oil & Refining Co., Magnolia Petroleum Co., Sinclair Prairie Oil Marketing Co., and H. F. Wilcox Oil & Gas Co. On same day Phiitex Oil Co. posted below 31°, 71 cents, with 2 cents added for each degree up to 40 and over at 91 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 5—Effective September 29, by Texas Co., Humble Oil & Refining Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Wilcox Oil & Gas Co., Continental Oil Co. On same day, Phiitex Oil Co. posted below 31°, 61 cents, with 2 cents added for each degree upward to 40 and over at 81 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 6—Effective September 29, by Humble Oil & Refining Co. and Tide Water Oil Co. and on September 30, by Texas Co., which on September 29 had posted a schedule of $1.07 to $1.12 with a 1-cent spread on each degree.

Column 7—Effective September 29, by Stanolind Oil & Gas Co.

Column 8—Effective September 29, by Humble Oil & Refining Co., Gulf Pipe Line Co., Shell Petroleum Corp., Pure Oil Co., Sinclair Prairie Oil Marketing Co. On October 2, Magnolia Petroleum Co. posted Lockport, Louisiana; 20-20.9°, 84 cents with 2 cents added for each degree upward to 34 and over at $1.12, and in Cameron Meadows and Iowa, Louisiana; below 20°, 72 cents with 2 cents added for each degree up to 34 and over at $1.02. These prices were 2 cents higher on each degree than Magnolia prices posted on September 29. Effective September 29, Shell Petroleum Corp. posted in Iowa, Louisiana, district: Below 20°, 70 cents, with 2 cents added for each degree upward to 34° and over at $1; and in Black Bayou and White Castle, Louisiana: Below 20°, 80 cents, with 2 cents added for each degree upward to 34° and over at $1.10.

Column 9—Effective September 30, Texas Co. (On September 29, Texas Co. had posted a schedule of 2 cents on each degree, but changed it on September 30.)

Column 10—Effective September 29, by Louisiana Oil Refining Co.

Crude Oil Prices

Oklahoma, Kansas, North Central and East Central Texas

East Texas $1.00
Corsicana (heavy) June 17, 1933)* ..... .80
Other fields ..... (See gravity table)

Note—In East Texas, effective September 29, 1933, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Shell Petroleum Corp., Gulf Pipe Line Co., Tide Water Oil Co., Sinclair Prairie Oil Marketing Co., Magnolia Petroleum Co., Sun Oil Co., Panola Pipe Line Co., Empire Oil & Refining Co., and Atlas Pipe Line Co. On October 22, 1934, the Atlas Pipe Line Co. posted 60 cents per barrel in East Texas.
*Magnolia Petroleum Co.

West Texas

Crane, Upton, Crockett, Howard, Glasscock, Mitchell (Sept. 29, 1933) ..... $.70
Ector, Winkler and Pecos Counties and Lea County, New Mexico (Sept. 29, 1933) ..... .75
Pecos County, Yates shallow Pool (Sept. 29, 1933)* ..... .65
Jones and Fisher Counties*See gravity table.
Note—Effective September 29, 1933, by Humble Oil & Refining Co., Texas Co., Gulf Pipe Line Co., Shell Petroleum Corp., Magnolia Petroleum Co., and by Stanolind Oil & Gas Co. in Winkler County, Texas.
*Shell Petroleum Corp.

Gulf Coast

Grade A and Grade B specifications discontinued by leading buyers.
..... (See gravity table)
Tomball (see note)* $1.15
Livingston (Sept. 29, 1933)† 1.00
Cleveland (Jan. 11, 1934) 1.00
Greta (Sept. 29, 1933) ..... .85
Refugio, light ..... (See gravity table)
Refugio, heavy (Sept. 29, 1933)‡ ..... .85
Markham and High Island ..... (See Gulf Coast gravity table)
Conroe, La. ..... (See Conroe gravity table)
Bosco, La. (Oct. 15, 1934)§ $1.02
Note—Tomball, effective September 29, by Humble Oil & Refining Co. and October 2, by Magnolia Petroleum Co., and November 10, by Stanolind Oil & Gas Co.
*Greta posted by Texas Co. †Shell Petroleum Corp. ‡Refugio heavy, by Humble Oil & Refining Co. Cleveland (Liberty County), posted by Magnolia Petroleum Co. §Bosco posted by Pure Oil Co.

South Central and Southwest Texas

(See note below table)

Darst Creek ..... $.87
Mirando ..... .80
Luling (Sept. 29, 1933) ..... .75
Pettus 1.05
Salt Flat ..... .87
Lytton Springs (Sept. 29, 1933) ..... .95
Duval County (Sept. 29, 1933) ..... .80
Saxet ..... .85

Note—Effective on September 29 by Humble Oil & Refining Co., in Darst Creek, Mirando, Pettus, Salt Flat and Saxet. Effective September 29 in Darst Creek by Gulf Pipe Line Co. and Texas Co. Effective October 2 by Magnolia Petroleum Co. Effective in Pettus and Salt Flat on September 29 by Humble Oil & Refining Co. and Gulf Pipe Line Co. Luling and Lytton Springs by Magnolia Petroleum Co. Duval County by Texas Co. Saxet, effective September 29, by Humble Oil & Refining Co. and Texas Co.

(Continued on Page 174)

TANK WAGON MARKETS

Quotations for gasoline and kerosene in United States, as furnished by the larger marketing concerns, include taxes

October 23, 1934

Taxes

The gasoline quotations given in the following tables include the 1 cent Federal tax, as well as state, county and city taxes. The gasoline quoted is the regular or standard grade. In most marketing areas a third grade and a premium grade are also available.

Discounts

Under the standard form of commercial consumer contract which went into effect March 1, 1934, save in California, Oregon, Washington, Arizona and Nevada, a discount of 1 cent a gallon off tank wagon, or 2 cents a gallon off retail prices, is permitted for purchases running between 4,000 and 10,000 gallons a month, and 2 cents a gallon off tank wagon, or 4 cents a gallon off retail prices, for purchases in lots of more than 10,000 gallons a month. The minimum delivery is 25 gallons.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Denver, Colo.	18.0	20.0	5.0	12.5
Pueblo	18.0	20.0	5.0	11.0
Grand Junction	20.5	22.5	5.0	15.0
Casper, Wyo.	18.0	20.0	5.0	11.5
Cheyenne	18.0	20.0	5.0	13.0
Butte, Mont.	21.0	23.0	5.0	17.5
Billings	21.0	23.0	6.0	16.5
Helena	23.0	25.0	6.0	17.5
Great Falls	21.5	23.5	6.0	17.5
Salt Lake, Utah	19.0	21.0	5.0	16.0
Boise, Idaho	22.5	24.5	6.0	18.0
Twin Falls	22.5	24.5	6.0	18.0
Albu'que, N. M.	18.0	20.0	*7.0	13.0

*One-cent city tax.

Effective March 1, 1934, discount to dealers with or without contract throughout Continental territory: Undivided dealer discount off service station price, 4 cents; divided dealer accounts, 3½ cents.

Standard Oil Co. (Indiana)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Chicago	12.8	12.8	4.0	8.0
Decatur, Ill.	14.4	9.9	4.0	10.2
E. St. Louis	14.1	9.9	4.0	9.5
Joliet	14.5	16.5	4.0	10.2
Peoria	14.4	10.0	4.0	10.2
Quincy	12.9	14.9	4.0	10.0
Davenport, Ia.	14.2	14.0	4.0	10.1
Des Moines	14.1	16.1	4.0	10.1
Mason City	14.4	16.4	4.0	10.1
Sioux City	14.3	16.3	4.0	9.7
Duluth, Minn.	15.0	17.0	4.0	10.4
Mankato	14.7	16.7	4.0	9.5
Minneapolis	15.7	13.4	4.0	10.4
LaCrosse, Wis.	15.7	17.7	4.0	10.8
Green Bay	15.9	17.9	5.0	10.2
Milwaukee	14.6	16.6	5.0	9.0
Madison	15.7	16.3	5.0	9.9
Detroit, Mich.	15.0	17.0	4.0	10.5
Grand Rapids	14.7	16.7	4.0	10.2
Saginaw	15.0	17.0	4.0	10.5
Evansville, Ind.	13.5	12.5	5.0	10.0
Indianapolis	16.1	18.1	5.0	10.2
South Bend	16.4	18.4	5.0	9.0
Fargo, N. Dak.	15.7	17.7	4.0	11.4
Huron, S. Dak.	16.2	18.2	5.0	11.4
Sioux Falls	15.6	17.6	5.0	10.9
Kans. C., Mo.*	13.6	15.6	4.0	7.5
Springfield	13.3	15.3	4.0	8.8
St. Louis	12.7	12.5	3.5	8.7
St. Joseph*	13.6	15.6	4.0	7.8
Wichita, Kans.	13.2	15.2	4.0	7.5
Bartlesville, Ok.	15.7	18.2	5.0	8.5

*State tax 2 cents, 1-cent city tax and 1-cent Federal tax.

Discounts to dealers, effective March 1, 1934: Undivided accounts, 4 cents a gallon on Red Crown Ethyl and Standard Red Crown, divided accounts, 3½ cents a gallon on Red Crown Ethyl and Standard Red Crown.

Stanolex Furnace Oil in Chicago

Effective Sept. 6, 1934, f.o.b. Chicago tank wagon prices: No. 1 (36-40 lt. stw. zero), less than 100 gallons, 8¼ cents; 100-149 gallons, 7¼ cents; 150 gallons or more, 6¾ cents; No. 2 (30-34, stw. zero), less than 150 gallons, 7¼ cents; No. 3 (22-26, zero), less than 150 gallons, 7 cents; No. 4 (12-16, zero), less than 400 gallons, 6½ cents; viscosity of No. 4, 90-115 at 100° F.; No. 5, less than 400 gallons, 5¾ cents. For deliveries of more than stated quantities of Nos. 2, 3, 4 and 5, deduct ½ cent.

Naphtha

	Tank wagon*
Oleum spirits	16.9
V.M.&P. naphtha	18.0
Cleaners' naphtha	18.0
Stanisol	18.0

*Prices include 3-cent Illinois tax, but not 1-cent Federal tax.

Prices f.o.b. Chicago, September 12, 1933. Each of above prices subject to discount of 1 cent per gallon for 150-gallon lots if covered by contracts.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atlanta, Ga.	19.0	22.0	7.0	14.5
Augusta	20.0	22.0	7.0	14.5
Macon	20.0	22.0	7.0	14.5
Savannah	19.0	21.0	7.0	14.0
Birm'ham, Ala.	18.0	20.0	8.0	11.0
Mobile	20.5	22.5	8.0	12.0
Montgomery	21.5	23.5	8.0	15.0
Jackson, Miss.	18.5	20.5	8.0	13.0
Vicksburg	15.5	17.5	7.0	12.0
Jack'ville, Fla.	18.0	20.0	8.0	11.5
Miami	18.0	20.0	8.0	13.5
Pensacola	18.0	20.0	8.0	13.5
Tampa	18.0	20.0	8.0	12.5
Lexington, Ky.	18.5	20.5	6.0	11.5
Covington	14.0	15.0	6.0	11.5
Louisville	18.0	20.0	6.0	11.0
Paducah	16.5	18.5	6.0	11.0

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia and Mississippi include 1 cent state tax; in Alabama, an inspection fee of one-half cent on kerosene and one-fortieth cent on gasoline; in Florida an inspection fee of one-eighth cent on kerosene and gasoline. To Pensacola, Mobile and Birmingham state taxes on gasoline add 1 cent city tax.

Southwestern District

MAGNOLIA PETROLEUM CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Dallas, Tex.	9.0	11.0	5.0	6.0
Fort Worth	9.0	11.0	5.0	7.0
Houston	15.0	17.0	5.0	8.5
San Antonio	16.0	18.0	6.0	8.5
El Paso	18.5	20.5	5.0	11.0
Muskogee, Ok.	16.0	18.0	5.0	6.0
Okla. City	15.0	17.0	5.0	7.0
Tulsa	16.0	18.0	5.0	7.0
Ft. Smith, Ark.	13.5	15.5	5.0	8.0
Little Rock	13.5	15.5	7.5	9.0
Texarkana	15.0	17.0	5.0	8.0

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atl'tic City, N.J.	14.5	14.0	4.0	10.0
Newark	12.9	12.4	4.0	8.5
Annapolis, Md.	16.1	15.6	5.0	10.0
Baltimore	15.0	14.5	5.0	9.5
Cumberland	17.0	16.5	5.0	12.7
Wash'g'n, D. C.	15.3	14.8	5.0	11.5
Danville, Va.	19.7	19.2	6.0	12.9
Norfolk	15.2	14.7	6.0	11.3
Pe.ersburg	18.5	18.0	6.0	11.4
Richmond	15.3	14 8	6.0	11.7
Roanoke	16.8	16.3	6.0	12.9
Charls'n, W.Va.	18.0	17.5	5.0	12.6
Parkersburg	15.8	15.3	5.0	11.2
Wheeling	18.0	17.5	5.0	12.2
Charlotte, N. C.	21.0	20.5	7 0	13.5
Hickory	19.0	18.5	7.0	13.7
Mt. Airy	21.7	21.2	7.0	13.8
Raleigh	19.0	18.5	7.0	13.3
Salisbury	16.0	15.5	7.0	13.6
Charleston, S.C.	19.2	18.7	7.0	11.3
Columbia	18 0	17.5	7.0	13.2
Spartanburg	18.0	17.5	7.0	13.5

Price basis to dealers: Divided dealers at dealer price, which is 2½ cents above tank car; undivided dealers at regular price less one-half cent. Discount for kerosene, 1 cent off tank wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except in New Jersey, where no discount is given.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Omaha	17.0	17.4	5.0	10.0
McCook	17.7	18.7	5.0	10.7
Norfolk	17.4	17.9	6 0	10.4
North Platte	17 8	18 3	5.0	10 0
Scottsbluff	18.3	18.3	5.0	9.0

Note—Discount to dealers, including any rentals under lease and agency agreements: Undivided accounts, Standard Red Crown and Red Crown Ethyl Gasoline 4 cents. Reliance (third brand) 3 cents, under service station price. Divided accounts, Standard Red Crown Ethyl Gasoline 3½ cents. Reliance (third brand) 2½ cents under service station price. Discounts to consumers covered only by form CD-1, official commercial consumer contract.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
N. Orleans, La.	18.8	18.3	*7.0	†12.0
Baton Rouge	18.2	17.7	6 0	†12 0
Alexandria	19.1	18.6	*7.0	†10.0
Lafayette	19.3	18.8	*7.0	†12.0
Lake Charles	19.2	18.7	*7.0	†12 0
Shreveport	13.5	13 0	6.0	†10.0
Knoxville, Tenn.	22.7	22.5	8.0	13.5
Memphis	21.1	20.6	8.0	10 5
Chattanooga	18.5	18.0	8.0	11.0
Nashville	22 0	21 5	8.0	12.0
Bristol	19.5	19.0	8.0	14.0

*Includes city tax of 1 cent. †Louisiana kerosene prices include 1-cent state tax.

Price bases to dealers: Divided dealers at dealer price, which is 2½ cents above tank car; undivided dealers at dealer price less one-half cent.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA*

	Gasoline: Tank wagon†	Gasoline: Posted retail	Gasoline: Incl'ds tax of	Kero. tank wagon
San Francisco	16.5	18.5	4.0	12.5
Los Angeles	15.5	17.5	4.0	12.5
Fresno, Calif.	17.0	19.0	4.0	14.0
Phoenix, Ariz.	20.0	22.0	6 0	‡16 0
Reno, Nev.	19.0	21.0	5.0	15.5
Portland, Ore.	19.0	21.0	6.0	13.5
Seattle, Wash.	19.0	21 0	6.0	13 5
Tacoma	19 0	21.0	6.0	13.5
Spokane	22.0	24.0	6.0	18.0

*Retail prices posted by Standard Stations, Inc., a subsidiary.

†Prices are at company's plant or depots, as company does not operate stations. A 4-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 1 cent.

‡Includes 5-cent state tax.

Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Philadelphia, Pa.	13.5	15.5	4.0	10.0
Pittsburgh	13.5	15.5	4.0	10.0
Allentown	13.5	15.5	4.0	10.0
Erie	13.5	15.5	4.0	9.0
Scranton	13.5	15.5	4.0	10.0
Altoona	13.5	15.5	4.0	10.0
Dover, Del.	13.5	15.5	4.0	10.0
Wilmington	13.5	15.5	4.0	9.0
Springf'd, Mass.	11.5	13.0	4.0	8.0
Worcester	12 5	13.0	4.0	8.5
Hartford, Conn.	14.0	16.0	3.0	7.5
New Haven	14.0	16.0	3.0	7.5
Providence, R.I.	11.0	11.5	3.0	8.0

Note—Tank wagon prices are those applicable to consumers purchasing lots of 100 or more gallons in one delivery.

New York and New England

SOCONY-VACUUM CO., INC.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Albany, N. Y.	15.0	16.0	4.0	8.5
Met. New York	16.5	17.5	4.0	8.5
Buffalo	16.5	17.5	4.0	9 0
Rochester	16.5	17.5	4.0	8.5
Syracuse	16.5	17.5	4.0	9.25
Boston, Mass.	12.5	13.5	4.0	8.5
Portland, Me.	17.5	18.5	5.0	8.75
Manch't'r, N.H.	14.5	14.5	5.0	9.0
Burlington, Vt.	19.0	20.0	5.0	9.0

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Ohio points	16.5	17.5	5.0	*12.5

*Includes state tax of 1 cent, effective July 22.

Canada*

IMPERIAL OIL, LTD.
Imperial 3-Star Gasoline

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Hamilton, Ont.	†21.0	23.5	6.0	17 0
Toronto, Ont.	†21.0	23.5	6.0	17 0
Brandon, Man.	30.3	33.3	7.0	21.0
Winnipeg, Man.	28.7	31.7	7.0	20.3
Regina, Sask.	29.0	32.0	6.0	21.0
Saskatoon, Sask.	31.8	34.8	6.0	24.3
Edmonton, Alta.	31 2	34.2	6.0	23.7
Calgary, Alta.	28.5	31.5	6.0	21.0
Vancouver, B.C.	†28.0	30.0	7.0	24.0
Montreal, Que.	24.0	27.0	6.0	17.0
St. John, N.B.	26.0	30.0	5.0	21.0
Halifax, N.S.	26.0	30.0	8.0	21.0

Imperial gallon used in Canada. †Governed by service station price.

Maritime provinces, all deals 4 cents off service station price. All other provinces open dealers 2.5 cents off service station price and 1 cent additional to 100 per cent accounts.

Retail Price Changes

Regular-Grade Gasoline and Kerosene

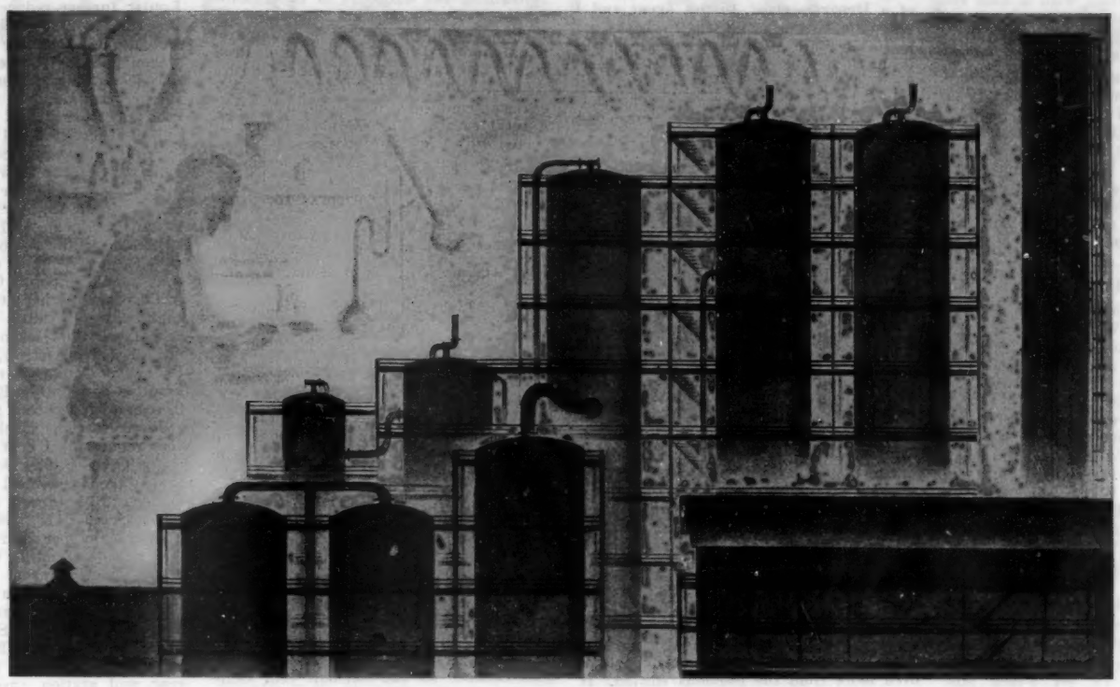
Standard Oil Co. of California, October 15, advanced tank wagon and station gasoline 2.5 cents in Reno.

Standard Oil Co. of New Jersey, October 11, reduced tank wagon and station gasoline 2 cents in Atlantic City; further reduced them 1.5 cents October 12, one-half cent October 13, and one-half cent October 16. October 11, reduced tank wagon and station gasoline 2 cents in Newark; further reduced them 1.4 cents October 12, 1 cent October 13, and 1 cent October 16. October 4 reduced tank wagon kerosene 1 cent in Newark. October 11, reduced tank wagon and station gasoline 2 cents in Annapolis; October 13, reduced them 1.5 cents further. October 11, reduced tank wagon and station gasoline 2 cents in Baltimore; October 13, reduced them 2.1 cents further. October 11, reduced tank wagon and station gasoline 2 cents in Cumberland; October 13, reduced them 1.6 cents further. October 11, reduced tank wagon and station gasoline 2 cents in Washington, Danville, Petersburg, Charleston, W. Va., and Charleston, S. C. October 11 reduced tank wagoon gasoline 2 cents in Mount Airy. October 11, reduced tank wagon and station gasoline 2 cents in Norfolk; further reduced them one-half cent October 13, one-half cent October 14, 1 cent October 15 and 1 cent October 16. October 11, reduced tank wagon and station gasoline 2 cents in Richmond; further reduced them 0.6 cent October 13, .6 cent October 14, 1 cent October 15 and 1 cent October 16. October 11 reduced tank wagon and station gasoline 2 cents in Roanoke; further reduced them one-half cent October 13, one-half cent October 14, 1 cent October 15 and 1 cent October 16. October 11, reduced tank wagon and station gasoline 2 cents in Parkersburg; further reduced them one-half cent October 13, one-half cent October 14 and one-half cent October 16. October 11, reduced tank wagon gasoline 2 cents and station gasoline 1.5 cents in Wheeling. October 11, reduced tank wagon gasoline 2 cents and station gasoline 1.1 cents in Charlotte. October 13, reduced them 4 cents further. October 11, reduced tank wagon gasoline 2 cents in Hickory; October 13, further reduced it 0.2 cent; October 13, reduced tank wagon and station gasoline 1.5 cents; October 15, reduced them 1 cent further. October 11, reduced tank wagon and station gasoline 2 cents in Raleigh; further reduced them 1 cent October 13 and 1.2 cents October 15. October 11, reduced tank wagon gasoline 2 cents in Salisbury; October 13, reduced it 0.6 cent further; October 13, advanced tank wagon and station gasoline one-half cent. October 11, reduced tank wagon gasoline

(Continued on Page 28)

CRUDE OIL PRICE CHANGES

The Atlas Pipe Line Co., a subsidiary of the Spartan Refining Co. of Shreveport, La., cut the price of East Texas crude 40 cents per barrel on Monday, October 22. It had been posting a price of $1 per barrel ever since the price was established late last September. Its new price is 60 cents per barrel. The company is reported to be running about 5,000 bbls. per day from the East Texas Field to the Spartan refinery in Shreveport.



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Late Fields

KANSAS

McBride, Inc. and others' No. 1 Wooldridge, C NW NW NE Section 16-27-7w, Kingman County, Kansas, found water in the Viola and in the Wilcox sands and was drilling with a hole full of water when Siliceous lime was topped at 4,300 feet. The test, a wildcat, was drilling at 4,316 feet.

Kirk and Jones' test, No. 1 McQuillan, C NE NW NE Section 21-29-2w, Sedgwick County, found the base of the Mississippi lime at 3,975 feet, and cored from 4,025 to 4,039 feet. All of the core was recovered, but it showed no oil saturation. Simpson was topped at 4,039 feet. The contract depth is 4,100 feet and if the well develops nothing at that depth it will be abandoned.

OKLAHOMA

The Mid-Continent Petroleum Corp.'s No. 1 Harjo, NE SW SE Section 31-7-8, Seminole County, and in the Fish Pool, found Wilcox sand at 4,238-43 feet, still in sand, and made 142 bbls. per hour for three hours and 2,715 bbls. in 19 hours. This test showed production in the Cromwell and Wapanucka formations.

Eason Oil Co.'s No. 2 Katscher, C NW NE SW Section 34-17-4w, Crescent Pool, Logan County, had Wilcox sand at 6,291 feet and drilled to 6,341 feet, penetrating the sand. It was plugged back to 6,334 feet and shot with 160 quarts at 6,280-6,334 feet. The casing collapsed and the crew was swaging. This well is on the extreme southeast side of the field.

Lynch and others' No. 1-A, SW NE SW Section 1-1-7, Pontotoc County, had a showing of oil in Hunton lime at 3,829-36 feet. The crew set 8-inch pipe at 3,815 feet and was waiting for cement to set.

The Mid-Continent Petroleum Corp.'s No. 1 Smith, C SE SW NE Section 28-22-2w, in the Polo Pool, Noble County, located 1,320 feet north and then 660 feet west of the discovery well on the Voss farm is a dry hole. It is being abandoned at 4,935 feet. The south offset to the dry hole is Stanolind Oil & Gas Co., Amerada Petroleum Corp. and Texas Co.'s No. 3 Voss. It was drilling at 4,660 feet. The pay in No. 1 Voss, the discovery well, was in the first Wilcox sand at 4,812-83 feet.

MICHIGAN

MUSKEGON Mich., Oct. 23.—Commercial flow of oil was reported encountered in a Beaverton Township, Gladwin County, wildcat about 20 miles north of the original Mount Pleasant Pool, Chippewa Township, Isabella County. M. F. Whitehill, Sr.'s No. 1 Omer Kintner, C S half NW NW Section 11, 17n-2w, is a prospective producer of light green oil at about 3,900 feet, or Monroe formation. The well was reported dry last week in the Dundee.

E. W. Marland Phones President Roosevelt

(Continued from Page 10)

action should be taken to avert the cut in price.

Mr. Marland Talks

Later in the day Mr. Marland said: "The oil companies threaten to cut the price of oil if overproduction is not stopped in East Texas. In my talk with the White House I directed attention to Section 9-A, Title No. 1 of the National Industrial Act. That section authorizes the President to institute before the Interstate Commerce Commission, proceedings necessary to prescribe regulations to control the operation of pipe lines.

"Under the power vested in the President, I believe that the Interstate Commerce Commission can stop this overproduction by stopping the purchase by pipe lines of illegally-produced oil. Overproduction would not be possible unless the pipe line companies bought the 'hot oil'—not only the interstate major pipe line companies but pipe line companies running from property to railroad sidings, tank cars and local refineries."

"I explained," Mr. Marland continued, referring to his long-distance conversation with the President, "that authorities at Austin, Tex., called me and said that petitions for an injunction were already prepared and needed only the signature of a Department of Justice agent and I urged that someone be sent to Texas immediately with authority to institute the injunction proceedings against overproduction.

"They have got to regulate the purchase of oil. They have got to stop the buying of 'hot oil' and they have not done that yet."

Drilling Costs in the Western Osage Pools

A price of $2.39 per foot for drilling wells in the South Burbank district and the Naval Reserve Field in Osage County, Oklahoma, was agreed upon at a meeting of the Drilling Practices Committee of the Planning and Coordination Committee held at Tulsa on October 22. The committee arrived at a figure of $2.39 per foot as the economic cost of cable tool drilling to the approximate depth of 2,804 feet in the two fields named.

This cost is exclusive of day work and is based on the regulation contract whereby the contractor furnishes drilling labor, supervision, and drilling equipment.

Petroleum Directory Covers Whole Industry

The 1934 edition of the World Petroleum Directory, just released from the press, contains 644 pages, nearly a hundred more than the previous edition. It devotes 197 pages to oil companies of the United States, including in this group refiners, producers, natural gasoline manufacturers, pipe line concerns, and firms which operate in all branches of the oil industry. Information furnished on these companies includes names of directors and officers; subsidiaries; history; capital structure; dividends; properties; financial reports for 1933 and quarterly reports for 1934.

For oil companies in countries other than the United States, this directory provides 132 pages of producers, pipe line operators, refiners and jobbers and marketers, arranged by countries and companies. Compounders and grease manufacturers in the United States are covered in 14 pages. Marketers and jobbers are presented in an exhaustive list, 202 pages being devoted to this one classification, with companies listed by states. This is followed by seven pages listing refining companies outside the United States. Four pages are devoted to oil associations in every state. Three lists covering producers of petroleum asphalt and road oil, of native asphalt and related bitumens, and of liquefied petroleum gases, are furnished.

Dudley Moore, P.O. Box 1821, Tulsa, is the Southwest representative and distributor for the directory.

MAY INCREASE INVENTORIES

Refiners who find their inventories of gasoline below an economic working limit will be allowed to add to stocks during the next three months according to approval of such an order by Administrator Ickes on October 18. The significant provision of the order states:

"If, after the allocating agencies have reviewed the inventory situation and the condition of all the refiners therein and have made all possible adjustments within the limits of the November gasoline allocation order, it shall then be determined by the Board of Review of the P. and C. Committee that the gasoline inventories of refining companies which may have submitted appeals are below the level required for efficient and orderly operations such companies may upon the recommendation of the P. and C. Committee and after approval by me, manufacture such additional amounts of gasoline as may be necessary to adjust the gasoline inventory situation."

Court Releases Tankers Detained on East Coast

NEW YORK, Oct. 20.—Judge Philip Forman in Federal District Court at Trenton, N. J., vacated temporary injunctions obtained by the Government restraining the discharge of the gasoline cargoes of the tankers Phoenix and Pueblo and dismissed the complaint on motion of the defendants, Hartol Products Corp. and the Republic Oil Refining Co. In the Hartol case the Government claimed some 2,000 bbls. out of a total cargo of 75,000 bbls. were connected with excess production.

At the hearing in Trenton the defendant companies produced evidence showing there was no violation of the Texas laws and further that they had no means of obtaining information as to the source of the crude. In denying the application for permanent injunction Judge Forman said:

"It is to be recalled that in this proceeding the attempt has been made to fasten the alleged wrongful production of the oil at its source upon a purchaser removed by several transactions from the source of production; in other words, the defendant is neither the producer of the oil, nor is even the refiner of the oil but simply the purchaser of a petroleum product, namely gasoline, and where the plaintiffs seek to burden such a purchaser with the sins of the producer, it should be on clear and conclusive evidence."

RETAIL PRICE CHANGES

(Continued from Page 26)

2 cents and station gasoline 1.5 cents in Columbia; further reduced them 1 cent October 13, 1 cent October 14, one-half cent October 15 and one-half cent October 16. October 11, reduced tank wagon gasoline 2 cents and station gasoline 1.6 cents in Spartanburg; further reduced them 0.9 cent October 13, 1 cent October 14, 1 cent October 15, and one-half cent October 16.

Standard Oil Co. of Louisiana, October 13, reduced tank wagon gasoline 3.5 cents in Shreveport, 4 cents in Chattanooga, and 3 cents in Bristol.

Socony-Vacuum Oil Co., Inc., October 11, reduced tank wagon gasoline 2 cents, station gasoline 3 cents and advanced tank wagon kerosene one-fourth cent in Manchester. October 11, reduced tank wagon kerosene three-fourths cent in Burlington. October 6, advanced tank wagon gasoline one-half cent and reduced station gasoline one-half cent in Boston. October 17 reduced tank wagon kerosene three-fourths cent in Rochester. October 18, reduced tank wagon kerosene one-half cent in Albany.

Standard Oil Co. of Kentucky, October 13, reduced tank wagon and station gasoline 1 cent in Covington; October 15, reduced them 1 cent further. October 4, reduced tank wagon and station gasoline 1.5 cents in Paducah. October 5, reduced tank wagon and station gasoline 4 cents in Jackson; October 8, advanced them 4 cents. October 13, reduced tank wagon and station gasoline 2.5 cents in Vicksburg. September 24, reduced tank wagon gasoline 1 cent in Atlanta; October 11, advanced it 1 cent. September 24, advanced tank wagon gasoline 2 cents and station gasoline 1 cent in Jacksonville; September 26, reduced tank wagon gasoline 1 cent; September 27, reduced station gasoline 1 cent. September 24, advanced tank wagon and station gasoline 1 cent in Miami; September 27, reduced them 1 cent. September 24, advanced tank wagon and station gasoline 1 cent in Pensacola. September 24 advanced tank wagon and station gasoline 1 cent in Tampa; September 27, reduced them 1 cent.

Atlantic Refining Co., October 19, reduced tank wagon and station gasoline 1 cent in Philadelphia, Allentown, Wilmington and Springfield. October 19, reduced tank wagon and station gasoline 1.5 cent in Pittsburgh, Erie, Scranton and Dover. October 11, reduced tank wagon kerosene one-fourth cent in Springfield.

Standard Oil Co. (Indiana), October 17, reduced station gasoline one-half cent in Chicago; October 18, reduced tank wagon gasoline one-half cent. October 11, reduced station gasoline 3 cents in Decatur; October 15, reduced it 3.8 cents further; October 20, reduced tank wagon gasoline 0.3 cent. October 8, reduced station gasoline 1 cent in East St. Louis; further reduced it 1.5 cent October 11, 2 cents October 15 and 2 cents October 17; October 20, reduced tank wagon gasoline 0.3 cent. October 5, reduced station gasoline 1 cent in Peoria; further reduced it 1 cent October 8, 1.7 cents October 12, 2 cents October 16 and 1 cent October 17. October 10, reduced tank wagon gasoline 1.7 cent in Quincy; October 11, reduced station gasoline 1 cent; October 15, reduced it 0.7 cent further. October 13, reduced station gasoline 2.5 cents in Davenport; October 20, reduced tank wagon gasoline 0.3 cent. October 9, reduced station gasoline 1 cent in Minneapolis; October 12, reduced it 1.6 cents further; October 20, reduced tank wagon gasoline 0.3 cent. October 8, reduced tank wagon and station gasoline 1 cent in Detroit, Grand Rapids and Saginaw. October 5, reduced tank wagon gasoline 2 cents in Evansville; October 9, reduced it 0.8 cent further; October 4, reduced station gasoline 2 cents; further reduced it 1 cent October 6 and 2.8 cents October 9. October 17, reduced tank wagon gasoline 1 cent in St. Louis; October 13, reduced station gasoline 1 cent; October 18, reduced it 1.2 cents further. October 20, reduced tank wagon and station gasoline 0.3 cent in Joliet, Des Moines, Mason City, Sioux City, Duluth, Mankato, La Crosse, Indianapolis, South Bend, Fargo, Huron, Sioux Falls, Kansas City, Springfield, St. Joseph, Wichita and Bartlesville. October 20, reduced tank wagon gasoline 0.3 cent and station gasoline 1.7 cents in Madison.

Magnolia Petroleum Co., October 8, reduced tank wagon and station gasoline one-half cent in Texarkana. October 17, reduced tank wagon and station gasoline 1.5 cents in Little Rock. October 22, reduced tank wagon and station gasoline 5 cents in Dallas and Fort Worth.

E. R. Filley Heads Kans.-Okla. Division

Everett R. Filley, divisional manager of the Texas Co., was re-elected president of the Kansas-Oklahoma division of the Mid-Continent Oil & Gas Association at its annual meeting. Other officers elected were as follows: First vice president, Rush Greenslade, general manager of the Gypsy Oil Co. and Gulf Pipe Line Co. of Oklahoma; vice president for Kansas, Tom C. Johnson of Wichita; vice president for northern Oklahoma, John H Kane, executive vice president of the Phillips Petroleum Co., Bartlesville; vice president for southern Oklahoma, Wirt Franklin, president of Wirt Franklin Petroleum Corp., Ardmore; secretary and treasurer, Clarel B. Mapes, Tulsa.

Memorials were read eulogizing members of the association who had died within the past year, including George W. Snedden, Pat Malloy, J. H. Dixon, W. A. Riley and J. H. Clark.

The outstanding work of the association in the past year was reviewed in reports of officers.

Secretary Mapes called attention to the good work of the tax committee, which will continue its efforts with Congress and with 42 legislatures that will meet early in 1935. Sixteen of these legislatures are in oil states and seven in the Mid-Continent region. He also directed notice to the valuable service of the nomenclature committee, headed by George A. Schwab of the Barnsdall Oil Co., which had to do with the naming of new pools and the standardizing of the names of oil fields; the work of the association in protesting the changes in government lease forms for lands of the Five Civilized Tribes in Oklahoma, and the protest of the association to the wage differential order of national oil administrator of May 21, and which received the support of other oil trade associations.

Tests in Andrews County Are Closely Watched; Wichita Falls Area Has 39 New Locations

By L. E. BREDBERG
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Oct. 22.—One of the most interesting tests in West Texas, Landreth Production Co. and others' No. 1 Scharbauer, in Section 20, Block 44, Township 1n, T.&P. Survey, northwestern Ector County, is drilling out plug after setting 7-inch casing. Total depth is 4,108 feet in lime where it had a showing of oil. It is about 15 miles west of the Cowden area, and 5 miles southeast of a small producer drilled by Davidson and others on the Cummings ranch.

Andrews County

Honolulu and Llano Oil Co.'s No. 1 Parker, 5 miles southeast of the Deep Rock Pool, in Section 7, Block A-44, Andrews County, encountered a showing of oil from 4,623-27 feet this week and cemented 7-inch casing. It has been running low structurally, but this showing of oil gives renewed interest.

Humble Oil & Refining Co.'s No. 2 Means, in Section 6, Block A-18, 1 mile southeast of the discovery well, topped the gray lime at 4,200 feet this week, 1,029 feet below sea level. It drilled to 4,238 feet. Seven-inch casing was cemented at 4,221 feet.

Another interesting test of Humble Oil & Refining Co. in Andrews County, is No. 1 Walker, in Section 6, Block A-43, between the Fuhrman producers and the Deep Rock Pool. It topped the gray lime at 4,009 feet during the week and cemented 7-inch casing at 4,013 feet.

Humble Oil & Refining Co. has staked location for its third test in the Means area of Andrews County, also to be known as No. 2 Means, 660 feet from the north line and 1,980 feet from the west line of Section 11, Block A-35, about 3 miles south and a little east of the discovery well.

Humble purchased a half interest in a block of 3,142 acres extending 15 miles northwest and 6 miles southeast of Seminole in Gaines County. Texas Pacific Coal & Oil Co. holds the other half interest. Consideration was $50,000, plus two free tests to be drilled by the purchaser.

Another test in the Andrews-Gaines County sector may be drilled by O. C. Harper and R. L. York of Midland. Tentative location has been made in the center of Labor 12, League 315, Parmer County School Lands. It is to go to 5,000 feet.

A remote wildcat was staked by King and Franklin on the Gage estate lands in Brewster County, in the center of Section 138, Block 22, G.H.&S.A. Survey.

Locations and Completions

A total of 11 locations was staked, all but two being in producing territory. There were 23 tests completed, Jones County having five of the seven dry holes. Illinois Oil Co.'s No. 2 University, in Section 36, Block 18, 2 miles south of the Taylor-Link Pool, in the vicinity of two small producers, in Pecos County, was abandoned at a total depth of 1,915 feet.

Gulf Production Co. has staked location for a wildcat in the SE cor. N half Section 4, Block 207, T.C.R.R. Survey. This is about 2 miles north of the Humble Oil & Refining Co.'s Ordovician test abandoned at 9,811 feet, and about 2 miles southeast of the Gulf Production Co.'s dry hole on the White and Baker ranch, drilled to 4,208 feet.

Another rumored test in Andrews County is supposed to be drilled by W. T. Walsh in Section 1, Block A-54, P.S.L. Survey, in the southwestern corner of the county, in extreme wildcat territory.

A block is being assembled centering in Section 25, Block 37, Township 1s, T.&P. Survey, on the Midland and Martin County lines for a test, but it will probably be some time before location is staked.

Crockett County

Humble Oil & Refining Co. is still working on a unitized Ordovician test on its block around Fort Lancaster in southern Crockett County, and another rumored Ordovician test is proposed east of the Yates Pool, but over in Crockett County.

Grisham and Hunter have taken top leases on 19 sections on the Ratliff-Bedford ranch, in Blocks 73 and A-54, in southwest Andrews County. The majority of the leases now in force in this area expire in April, 1935.

Sayre Oil Co. has made location one-half mile northwest of its discovery well in northern Winkler County, to drill on the L. Daugherty ranch, in Section 2, on Texas Pacific Coal & Oil Co. lease.

WICHITA FALLS

There were 39 locations staked in the Wichita Falls district and 22 tests were completed, Archer County leading.

Everets Drilling Co. of Dallas, abandoned its deep test in the Chalk Hill area on the Kemp lands in Block 5, W.V.F. lands, 3 miles southwest of Kemp City in northern Archer County, this week. It was drilled to a total depth of 3,971 feet and treated with 2,000 gallons of acid.

One-half mile north of Kemp City, Deep Oil Development Co. has treated No. 2-A Munger, in Block 30, W.V.F.L. Survey, at 3,720-90 feet, and is cleaning out preparatory to testing.

Texas Co.'s No. 1 T. Subenbach, in the J. Clark Survey, Cooke County, logged an oil sand with showing of oil from 1,380-1,405 feet and saturated lime from 1,407-21 feet, shutting down at the latter depth where it filled 215 feet with oil in 13 hours, testing 39.9 gravity. It was treated with 1,100 gallons of acid and flowed 18 bbls. per hour with a little water after cleaning out. Initial production was 280 bbls. of oil and 35 bbls. of salt water in 24 hours. This is the largest well developed in the county and open a large area extending on a northwest-southeast lime high.

Merry Brothers and Perrini of San Angelo have blocked 6,770 acres in Block 2, H.&T.C. Survey, Fisher County, and a total of 7,900 acres on the Fisher-Stonewall County lines. They are now drilling in Stonewall County and will probably put down a test on their block in Block 2 in Fisher County.

C. M. Joiner of Dallas has leased 30,000 acres in a block north of Morgans Hill, 7 miles east of the X-Ray gas field, in Erath County, and proposes to sink a 4,500-foot Ellenburger test.

W. B. Hamilton of Wichita Falls has purchased the north 73 acres of the Charles S. Arnold 400 acres in the J. Levins Survey, Archer County, on which there are six lime producing wells with a daily gross production of 20 bbls.

Daily average production in the Wichita Falls district averaged 62,130 bbls. during the week, a slight decrease.

PANHANDLE DISTRICT

Humble Oil & Refining Co.'s wildcat discovery on the Logan lands, in Section 1, A. B. Pedigo Survey, 2 miles west of Pringle and 7 miles north of the nearest production near Stinnett, Hutchinson County, is shut down at 3,296 feet, making some water with the oil after shooting. This well, on an 11,000-acre block held by the company, increased by 1,600 acres in a recent purchase, topped the pay at 3,217-19 feet from which it produced 5 bbls. of oil per hour through tubing for 12 hours. It is estimated good for a 60 or 70-bbl. well at present depth. The test has opened a considerable lease play on a trend between the discovery and the older production to the south. To intensify the lease play, Amtex Oil Co.'s (formerly Ortex Oil Co.) No. 1 Stevenson, in the NE of Section 7, Block M-24, T.C. Survey, about midway between the discovery and the production at Stinnett, had a showing of oil in lime at 3,185-90 feet with an increase of 3,216-90 feet. It is shut down at the latter depth with 200 feet of oil in the hole and appears as a connecting link between the two areas. This test will probably be shot before a test. Other tests are expected to be spudded on intervening acreage between the old producing area and the Amtex and Humble discoveries, possibly proving the trend between the areas and extending production.

There were 12 locations in the Panhandle district and 19 tests were completed. Production in the district averaged 54,770 bbls. per day.

RANGER DISTRICT

Brown County

Petroleum Interests, Inc.'s No. 1-A Williams, total depth 2,770 feet, initial production 5 bbls. of oil and 3,500,000 feet of gas. Sher-Ritt Oil Co.'s No. 3-A Densman, total depth 1,179 feet, initial production 30 bbls.

Callahan County

Anzac Oil Corp.'s No. 1 Ludie H. Owens, dry and abandoned at 2,575 feet. Gallagher and Lawson's No. 3 Kelton, dry and abandoned at 780 feet.

Coleman County

Anzac Oil Corp.'s No. 3 Allen, dry and abandoned at 815 feet. Hart and others' No. 1 Jennings, abandoned location. Culberson Brothers' No. 1 Hill, dry and abandoned at 1,993 feet.

Eastland County

Hoffman and Page's No. 9 Lyerla, dry and abandoned at 1,280 feet. Harmon's No. 1 Harrell, abandoned location.

Shackelford County

Charter Oil Co.'s No. 5-A Morris and Buie, total depth 1,610 feet, initial production 100 bbls. Reliance Oil & Royalty Co.'s No. 2 Dillar, top pay 502 feet, total depth 520 feet, initial production 2 bbls.; No. 19-S Matthews, dry and abandoned at 1,150 feet. Roeser and Pendleton's No. 16 Morris and Buie, top pay 1,609 feet, total depth 1,621 feet, initial production 10 bbls. Tannehill Oil Co.'s No. 34 Newell, top pay 931 feet, total depth 941 feet, initial production 15 bbls. Walker's No. 6 Walker, dry and abandoned at 550 feet.

COMPLETIONS IN WEST TEXAS

Ector County

Skelly and Amerada Petroleum Corp.'s No. 5-A University, top pay 3,600 feet, total depth 3,690 feet, shot with 280 quarts from 3,540-3,690 feet, initial production 411 bbls. Sun Oil Co.'s No. 1 Wight, top pay 4,117 feet, total depth

(Continued on Page 33)

Wildcat Operations in West Texas

Week Ending October 20

ANDREWS COUNTY

R. S. Bond et al's No. 1 McCarley, 1,320 ft. from N and W, Sec. 29, Blk. 3, P.S.L. Sur.
Drlg. 2,565 ft.

Honolulu and Llano Oil Co.'s No. 1 J. E. Parker, 1,320 ft. from S line and 1,470 ft. from W line of Sec. 7, Blk. A-44, P.S.L. Sur.
T.D. 4,627 ft.; set csg. 4,484 ft.

Humble Oil & Ref. Co.'s No. 1 B. S. Walker, 660 ft. from E line and 660 ft. from S line of Sec. 6, Blk. A-43, P.S.L. Sur.
Drlg. 4,072 ft.

Humble Oil & Ref. Co.'s No. 2 Means, 1,980 ft. from S and 1,487 ft. from W, Sec. 6, Blk. A-19.
T.D. 4,238 ft.; set csg. at 4,221 ft.

Humble Oil & Ref. Co.'s No. 2 Means, 660 ft. from N and 1,980 ft. from W, Sec. 11, Blk. A-35.
Location.

BORDEN COUNTY

Moore Bros.' No. 1 Clayton & Johnson, 1,320 ft. N and E, Sec. 29, Blk. 32, Twp. 4n, T.&P. Sur.
Location.

BREWSTER COUNTY

Joiner et al's No. 1 McIntyre, 353 ft. from S, 2,390 ft. from E of Sec. 31, Blk. 352, W. M. Mitchell Sur.
S. D. 2,100 ft.

King & Franklin's No. 1 Gage Est., C Sec. 138, Blk. 22, G.H.&S.A. Sur.
Drlg. 220 ft.

COCHRAN COUNTY

West Texas Development Co.'s No. 1 Slaughter, C of Lobaur, Sec. 53, Blk. 194, Randall Co. School Lands.
Derrick.

COKE COUNTY

Wm. Hooper's No. 1 Gaston, 240 ft. from S line and 654 ft. from W line of Joseph Sur. No. 11.
S.D. 2,560 ft.

CRANE COUNTY

Continental Oil Co.'s No. 1 M. Dawson, 1,320 ft. from N and 440 ft. from E, Sec. 80, Blk. X.
T.D. 2,478 ft.; to acidize; pay 2,445 ft.

Loffland Bros. et al's No. 1 Tubbs.
Preparing to deepen; T.D. 4,510 ft.

Strauss' No. 1 Phelps et al, 2,113 ft. from N and 713 ft. from NW Sec. 13, Blk. 31, H.&T.C. Sur.
T.D. 300 ft.

CULBERSON COUNTY

Anderson-Pritchard Oil Corp., Magnolia Pet. Co. et al's No. 1 Borders, 1,255 ft. N and 2,305 ft. from W, Sec. 34, Blk. 69, P.S.L. Sur.
Fishing 423 ft.

Miller Bros.' No. 1 fee, 1,900 ft. from N and 660 ft. from E line of Sec. 21, Blk. 97, P.S.L. Sur.
Drlg. 1,705 ft.

World et al's No. 1 Hall, 250 ft. from S and 85 ft. from E, Sec. 11, Blk. 54½, 16 miles N of Van Horn, P.S.L. Sur.
Drlg. 235 ft.

DAWSON COUNTY

Ray Albaugh et al's No. 1 John Robinson, 1,320 ft. from N line, 1,320 ft. from W line of Sec. 46, Blk. M, E.L.R.R. Sur.
S.D. 2,957 ft.

ECTOR COUNTY

Black et al's No. 1 Connell, 330 ft. from S and 2,310 ft. from W, Sec. 1, Blk. B-16, P.S.L. Sur.
Spudded and S.D.

Harrison et al's No. 3 Addis, 1,650 ft. from N line and 2,200 ft. from W line of Sec. 35, Blk. 43, Twp. 2s, T.&P. Sur.
Drlg. 937 ft.

Landreth Prod. Co.'s No. 1 Johnson, 440 ft. from N and W, Sec. 47, Blk. 43, Twp. 1s, T.&P. Sur.
Drlg. 745 ft.

Landreth Prod. Co.'s No. 2-A Texas Pacific Land Trust, 441 ft. from N line and 440 ft. from W line of Sec. 3, Blk. 43, Twp. 1s, T.&P. Sur.
T.D. 4,275 ft.; plugged back 4,248 ft.; Making 10 bbls. per day.

Landreth Prod. Co.'s No. 1 Clarence Scharbauer, 660 ft. from S and E. lines of Sec. 20, Blk. 44, Twp. 1n, T.&P. Sur.
Show oil 4,102 ft.; T.D. 4,108 ft.; set csg.

Skelly Oil Co.'s No. 1 Scarborough, 617 ft. from S and 660 ft. from E, Sec. 26, Blk. B-15, P.S.L. Sur.
Drlg. 3,450 ft.

Stanolind Oil & Gas Co.'s No. 8 J. M. Cow-

(Continued on Page 33)

Hopkins and Franklin Counties Are Getting Play; Salt Water Encroachment in East Texas Field

By L. E. BREDBERG

DALLAS, Tex., Oct. 22.—Hill and Hill of Fort Worth have erected rotary rig in the southeast corner of a 50-acre tract in the Jasper Williams Survey, in southeast Hopkins County, causing a considerable lease play in this area extending into southwestern Franklin County. Phillips Petroleum Co. formerly held the block around the Hill and Hill location and now holds the 60-acre tract offsetting the test to the south, besides other acreage. Barnsdall Oil Co. holds a 60-acre lease diagonally to the southeast of the location.

Cosden Oil Co. has probably one of the most interesting wildcats drilling in the district on the Hurt & Miller lands in the J. D. Hays Survey, 11 miles south of Chandler, in Henderson County. It topped the Austin chalk at 4,385 feet and is temporarily shut down at 4,475 feet. It is running around 160 feet higher on this formation than a dry hole west of it.

Freestone County

E. L. Smith Oil Co. and others' wildcat on the Coward Estate, in the A. G. Smith Survey, 4½ miles south of Dew, in Freestone County, topped the Pecan Gap chalk at 3,370 feet and is drilling at 3,400 feet.

Rio Oil Co.'s No. 1 Easter, in the R. Hotchkiss Survey, in the eastern part of Rains County, drilling on the second hole after rig was skidded because of junked hole, logged top of the Austin chalk at 3,472 feet. Base of the Austin in the junked hole was 3,815 feet. The test is drilling at 3,950 feet in shale, running higher than Greer's dry hole to the north and west and higher than the Markowitz dry hole to the west.

There is to be more prospecting in the shallow horizon area of the North Currie Field, Navarro County, by J. B. Stoddard of Dallas, and associates, who have acquired leases on around 2,400 acres in this area. They will later drill an upper Woodbine sand test, former tests having been drilled through this section into the lower stratum.

Syam Oil Co.'s No. 1 Ray, in the E. Powers Survey, Navarro County, logged the base of the Austin chalk at 3,150 feet and is drilling around 3,500 feet. This is one of a series of tests drilled for Woodbine sand production, the others proving failures.

EAST TEXAS FIELD

The latest report on the salt water situation in the East Texas Field shows a total of 860 wells making various percentages of water. There are 316 of these wells making 3,802 bbls. per day, in the Henderson area of Rusk County; 302 wells making 3,628 bbls. of water per day in the Kilgore area, and 242 wells making 3,631 bbls. of water per day in the Longview area, Gregg County. There are 139 wells making 35 per cent water or above, many making over 85 per cent. Twenty-five wells have been abandoned because of drowning out and 88 are dead, inactive or abandoned because of salt water encroachment. Operators and companies have plugged back and worked over a considerable number of wells in an effort to clear them of water, and as a result 124 such wells have been cleared. Operators and companies drilling tests on the west side of the field, in the water area, are taking in but a little sand in an effort to keep down water encroachment, a few feet of sand yielding sufficient oil to make the daily allowable.

There were nine wells completed in the Joiner area, Rusk County, as pumpers, this week and several other small wells. One test, on the west side in Smith County, was abandoned after drilling to 4,153 feet, and a test drilled on the Castleberry lands, in Gregg County, was abandoned by Stanolind Oil & Gas Co.

There were 81 tests completed in the field this week, two dry. There were 60 locations staked for other tests. The total wells in the field will soon reach the 15,000 mark, the per well density now being around one well to each 7.4 acres, with the operators holding small tracts seeing how many wells they can stick on them, the Railroad Commission granting permits to drill exception wells all over the field.

East Central Texas Wildcats

Week Ending October 20

ANDERSON COUNTY

Gulf Prod. Co.'s No. 1 Dovey & Royall, 330 ft. from NE and NW of 172-ac. tract, M. Rogers Sur.
Material.

J. W. Luttes' No. 1 C. McKee, 357 ft. from S line, 340 ft. from W line of 100-ac. tract. W. F. Pool Sur., SE of Frankston Sur.
Derrick.

Trinity State Oil Co.'s No. 1 Trinity River, 1,870 ft. N and 1,200 ft. W of SW cor. of Sullenberger lands, Wm. Snyder Sur.
Material.

BOWIE COUNTY

Tex-Ark. Oil Co.'s No. 1 Hamilton Estate, 600 ft. E and 350 ft. N lines, J. Milan Sur., 4 miles S of Red River.
Derrick.

CHEROKEE COUNTY

H. L. Hunt Production Co.'s No. 1 Powell Lumber Co., 467 ft. from S and W lines of 52-ac. tract, 1 mile E and one-quarter mile N of discovery well, D. W. McNab Sur.
Location.

Jackson Oil & Gas Co.'s No. 1 H. D. Henderson, 660 ft. from N and W line of 40-ac. tract out of Tankersley 104-ac. tract, 5 miles NE of Jacksonville on W side of railroad, J. Pineda Sur.
T.D. 752 ft.

Guy Jameson et al's No. 1 Mullineaux, cen. 20-ac. tract out of NW cor. of SE of T. M. Garrett Sur., 5 miles NW of Maydell.
Spudded.

South Gulf Oil Co.'s No. 1 Joe Bailey, center 164-ac. tract, 4 miles NE of Ponta, L. R. Rhodes Sur., Abstract No. 724.
S.D. 4,397 ft.; Schlumberger showed oil 4,103-23 ft. and 4,148-87 ft.

E. M. Thomason et al's No. 1 Addis Estate, 250 ft. S of survey and 150 ft. E of railroad, J. T. Jones Sur., 6 miles NW Alto.
S.D. 2,150 ft.

Wilson Stubbs Oil Co.'s No. 1 Rowborts, 450 ft. from S line, 150 ft. from W line of 100-ac. tract, 2 miles SW of Jacksonville, J. D. Wolfin Sur.
S.D. 1,550 ft.

ELLIS COUNTY

Beckner-Finley et al's No. 1 Coker, 2,900 varas along S line of grant from river and 1,700 varas N at R/A, R. De La Pena Sur.
Shut down.

FALLS COUNTY

Eureka Drlg. Co.'s No. 1 L. Davis, 150 ft. N of Blk. 19, and 1,970 ft. W of Blk. 18, Zora League, 8 miles N of Marlin.
16 gallons oil per day at 1,020 ft.; drlg. 1,150 ft.

FANNIN COUNTY

L. Kean et al's No. 1 L. M. Boyd, 900 ft. from E line and 200 ft. from N line of survey, W. Hunt Sur.
S.D. 2,505 ft.

FREESTONE COUNTY

Burris' No. 1 R. J. Johnson, NE cor. of a 95-5-ac. tract, W. M. C. Jones Sur.
S.D. 1,000 ft.

Halley-Young's No. 1 Cochran, 400 ft. N and W lines, D. Bullock Sur., 1 mile SE of Lima.
Location.

E. L. Smith et al's No. 1 Heimple, 450 ft. out of NE cor. A. G. Smith Sur., 4½ miles S of Dew.
Drlg. 2,487 ft.

HENDERSON COUNTY

Campbell and Chamberlain's No. 1 R. Ansley, 1,724 ft. W and 300 ft. S of SE cor. of M. Matthews Sur., N. H. T. Thompson Sur.
S.D. 3,650 ft.

Cosden Oil Co.'s No. 1 Hunt & Miller, 990 ft. from N and 1,340 ft. from W lines of J. D. Hays Sur., 11 miles S of Chandler.
Top Pecan 3,320 ft.; drlg. 3,325 ft.

Crosby and Pulp's No. 1 M. T. Dobbs, NW cor. of east Dobbs 100-ac. tract, 4 miles E of Malakoff and S of Railroad, George Aldrick Sur.
S.D. 3,118 ft.

HOPKINS COUNTY

D. A. Hale et al's No. 1 L. M. Hall, 200 ft. from N and E lines of 70a-c. tract, 1 mile SE of Miller Gros, A. Caro Sur.
S.D. 760 ft.

Hill & Hill's No. 1 Jones, 2,188 ft. E and 1,746 ft. S of Jasper Williams Sur, 8 mi. SE of Picton.
Location.

HUNT COUNTY

G. S. & S. Co.'s No. 1 O. Popper.
Coring 2,878 ft.

J. C. Hall's No. 1 Parrish, C of 100-ac. tract N. Delaney Sur., 5 miles N of Lone Oak.
Derrick.

L. G. Priest's No. 1 Amelia Barnett, 1,075 ft. from W line, 320 ft. from S line of J. C. Hamer Sur.
S.D. 1,735 ft.

KAUFMAN COUNTY

W. J. Lewis et al's No. 1 D. Clark, 430 ft. from S line and 600 ft. from E line of Sur., 6½ miles NW of Elmo.
S.D. 478 ft.

LEON COUNTY

Normangee Corp.'s No. 1 B. H. Henry, 1,850 ft. from E line and 3,700 ft. from N line of survey, Robert Rogers League, 2⅝ miles NE of Normangee.
Drlg. 2,646 ft.

LIMESTONE COUNTY

Doughtry et al's No. 1 S. Welch, 150 ft. from NW and 900 ft. from NE of 77.64-acre tract in A. Varilia Sur., 4 miles W of Groesbeck.
Rigged up.

Schultz' No. 1 Roy Ward, NE cor. of 73.3-ac. tract, 5 miles W of Mexia Field, Harrison York Sur.
Derrick.

V. V. Waite's No. 1 Barrow, 650 ft. from S and 950 ft. from E line of 320-ac. tract, W. G. McKenzie Sur., 3½ miles NW of Thornton.
Location.

MORRIS COUNTY

McGinnis et al's No. 1 Staggers, 800 ft from S line of survey and 150 ft. from W line of lease, J. B. Nelson Sur.
Drlg. 3,932 ft.

Flutborn Oil Corp.'s No. 1 Hammond, 3,500 ft. S and 1,750 ft. W of Thos. Burford Sur., 8 miles SE of Omaha.
Material.

NACOGDOCHES COUNTY

Murray Oil Co.'s No. 1 C. B. Watkins, 150 ft. from N line and 330 ft. from NW lines of 160-ac. tract, 3 miles S of Caro, H. Y Bailey Sur.
S.D. 3,300 ft.

NAVARRO COUNTY

Bennett Brothers' No. 1 T. E. Stewart, 150 ft. from NE line of lease, 10 miles SW of Corsicana, Wm. R. Bowen Sur.
S.D. 1,186 ft.

R. B. Cocding et al's No. 1 Lela Kelt, 450 ft. from S line and center of N and S lines of lease, 3 miles NE of Chatfield.
C. B. Emmons Sur.
S.D. 1,546 ft.

W. J. Keeling et al's No. 1 J. F. Rushing 484 ft. from N line and 150 ft. from W line of 184-ac. tract, 6 miles SW of Richardson, Henry Ford Sur.
S.D. 2,878 ft.

McCullough et al's No. 1 C. Berry, 330 ft. from SE cor. of 35-acre tract, 1 mile W of Dawson, William Moss Sur.
S.D. 625 ft.

Syam Oil Co.'s No. 1 Mrs. Ray, 965 ft. E along N line from NW cor. Stevenson 101-acre tract and 305 ft. N at right angles, 3 miles SW of Rural Shade.
Spudded; top Austin 2,799 ft.; coring 3,185 ft.

RAINS COUNTY

Wadley et al's No. 1 P. F. Jones, 400 ft. out of SW cor. of 22-ac. tract, 2½ miles S of Alba, B.B.B.&C. Sur.
T.D. 4,730 ft.

Rio Oil Co.'s No. 1 Johnson, 330 ft. N and W of 39 ac. tract, R. Hitchkiss Sur., 4½ miles E of Emory.
Drlg. 2,961 ft.

RUSK COUNTY

Headwater Oil Co.'s No. 1 F. L. Gary, 375 ft. N of S line and center of E and W lines of 200-ac. tract, 8 miles E and S of Henderson, Jose A. Mora Sur.
S.D. 3,197 ft.

George Hudson et al's No. 3 Jeff Phillips, 150 ft. from N line of survey and 700 ft. from W line of 100-ac. tract, 4 miles SE of Minden, N. Villaria Sur.
Bailing 3,673 ft.

Ben Lamb's No. 1 H. Leath, 330 ft. out of NW cor. of 185-acre tract in L. J. Dooley Sur., 2½ miles E of Pirtle.
S.D. 700 ft.

SMITH COUNTY

Deck et al's No. 1 Dendall, 330 ft. from S and W of 55-ac. tract, J. Williams Sur., 3 miles E of Van Field.
Spudded and S.D.

(Continued on Page 33)

Anderson County

Tide Water Oil Co.'s No. 8 Eden, total depth 4,051 feet, initial production 120 bbls. in 24 hours through nine-sixty-fourths inch choke.

Cherokee County

Smith and Hoffman's No. 1 Tipps, dry and abandoned at 3,972 feet.

Van Zandt County

Pure Oil Co.'s No. 6 Cook, total depth 2,969 feet, initial production 50 bbls.; No. 11 Jarman, total depth 2,954 feet, initial production 100 bbls. Sun Oil Co.'s No. 5 Wallace, total depth 2,963 feet, initial production 65 bbls., pumping.

Freestone County

Milburn and others' No. 1 Palmer, dry and abandoned at 171 feet.

Lamar County

Coles' No. 1 LeMartin, dry and abandoned at 2,446 feet.

Limestone County

Peyton Brothers' No. 1 Steubenrach, dry and abandoned at 6,116 feet.

Nacogdoches County

Rich's No. Hazelwood, dry and abandoned at 701 feet.

Navarro County

Wheelock and Collins' No. 1 Cerf, dry and abandoned at 6,506 feet.

Red River County

Comell and Spears' No. 1 Thompson, dry and abandoned at 2,040 feet.

Gregg County

Arkansas Fuel Oil Co.'s No. 6 Hestand, top pay 3,610 feet, total depth 3,632 feet, initial production 21 bbls. in 15 minutes; No. 7 Orms, top pay 3,553 feet, total depth 3,578 feet, initial production 25 bbls. in 15 minutes; No. 10 Whittaker, top pay 3,514 feet, total depth 3,539 feet, initial production 80 bbls. Atlantic Oil Producing Co.'s No. 10 Anderson, top pay 3,476 feet, total depth 3,519 feet, initial production 100 bbls.; No. 11 Anderson, top pay 3,474 feet, total depth 3,524 feet, initial production 100 bbls. Barnsdall Oil Co.'s No. 7 Ferguson, top pay 3,642 feet, total depth 3,652 feet, initial production 80 bbls. F. H. E. Oil Co.'s No. 14 Christian, top pay 3,624 feet, total depth 3,660 feet, initial production 30 bbls. in 20 minutes.

Gulf Production Co.'s No. 61 Judge, top pay 3,484 feet, total depth 3,535 feet, initial production 93 bbls. Humble Oil & Refining Co.'s No. 21 Holland, top pay 3,550 feet, total depth 3,595 feet, initial production 146 bbls.; No. 11 Hughes, top pay 3,600 feet, total depth 3,632 feet, initial production 70 bbls.; No. 16 Mackey, total depth 3,629 feet, initial production 55 bbls. Humphrey's No. 4 Thomas, top pay 3,574 feet, total depth 3,585 feet, initial production 43 bbls. in four hours. Island Oil Co.'s No. 7 Aiken, top pay 3,572 feet, total depth 3,610 feet, initial production 100 bbls. Lucey Petroleum Corp.'s No. 9 Fisher, top pay 3,532 feet, total depth 3,555 feet, initial production 99 bbls.

Shell Petroleum Corp.'s No. 7 Moore, top pay 3,540 feet, total depth 3,600

feet, initial production 18 bbls. in 15 minutes. Stanolind Oil & Gas Co.'s No. 1-A Castleberry, dry and abandoned at 3,718 feet; No. 7 Stuckey-Thrasher, top pay 3,543 feet, total depth 3,614 feet, initial production 27 bbls. in one-half hour; No. 8 Stuckey-Thrasher, top pay 3,532 feet, total depth 3,598 feet, initial production 23 bbls. in one-half hour; No. 1 Key, top pay 3,557 feet, total depth 3,631 feet, initial production 34 bbls. in 30 minutes. Sun Oil Co.'s No. 23 Haynes, top pay 3,561 feet, total depth 3,610 feet, initial production 64 bbls. T. W. M. Production Co.'s No. 10 Sabine River Bed, top pay 3,567 feet, total depth 3,579 feet, initial production 15 bbls. in 45 minutes. Adams & Lyles' No. 9 Howard, top pay 3,621 feet, total depth 3,625 feet, initial production 25 bbls. in 20 minutes.

American Liberty Oil Co.'s No. 29 Sabine River Bed, top pay 3,529 feet, total depth 3,544 feet, initial production 20 bbls. in 15 minutes; No. 10 Sabine River Bed, top pay 3,461 feet, total depth 3,509 feet, initial production 25 bbls. in 15 minutes. Arkansas Fuel Oil Co.'s No. 17 Hughey-Ross, top pay 3,537 feet, total depth 3,562 feet, initial production 38 bbls. in 15 minutes. Catlett's No. 1 Catlett, total depth 3,586 feet, intial production 80 bbls. Doss and Jones' No. 6 Hagler, top pay 3,562 feet, total depth 3,572 feet, initial production 60 bbls. in 30 minutes. Gulf Production Co.'s No. 16 Cole, total depth 3,542 feet, initial production 68 bbls.; No. 18 Holt, total depth 3,604 feet, initial production 95 bbls. Henry Oil Co.'s No. 5 Laird, top pay 3,562 feet, total depth 3,610 feet, initial production 60 bbls. Humble Oil & Refining Co.'s No. 60-B Laird, top pay 3,557 feet, total depth 3,625 feet, initial production 20 bbls. in 20 minutes. Humphrey's No. 4-B Spear, top pay 3,557 feet, total depth 3,597 feet, initial production 20 bbls. in 30 minutes.

Kilgore Refining Co.'s No. 12 I.&G.N., total depth 3,597 feet, initial production 50 bbls. Magnolia Petroleum Co.'s No. 9 Cole, total depth 3,614 feet, initial production 60 bbls. Miller's No. 1-B Laird, total depth 3,575 feet, initial production 50 bbls. Navarro Oil Co.'s No. 5 Green, top pay 3,559 feet, total depth 3,574 feet, initial production 6 bbls. per hour, swabbing. Sawell Brothers' No. 2 Wells, top pay 3,655 feet, total depth 3,656 feet, initial production 75 bbls. Sultan Oil Corp.'s No. 1-F Sabine River Bed, top pay 3,526 feet, total depth 3,552 feet, initial production 125 bbls. Sun Oil Co.'s No. 7 Smith, top pay 3,653 feet, total depth 3,671 feet, initial production 60 bbls. Texas Co.'s No. 42 Cole, top pay 3,508 feet, total depth 3,559 feet, initial production 35 bbls. in 30 minutes; No. 7 Walker, top pay 3,588 feet, total depth 3,591 feet, initial production 21 bbls. in 40 minutes.

Rusk County

Coffman Petroleum Co.'s No. 4 Cooper, top pay 3,717 feet, total depth 3,718 feet, initial production 40 bbls. in 20 minutes. Fox-Wood's No. 3 Morris, top pay 3,635 feet, total depth 3,660 feet, initial production 70 bbls. Gulf Production Co.'s No. 12 Sexton, top pay 3,660 feet, total depth 3,699 feet, initial production 45 bbls. through three-quarters inch choke. Humble Oil & Refining Co.'s No. 126 Crim, top pay 3,626 feet, total depth 3,652 feet, initial production 120 bbls.; No. 133 Crim, top pay 3,585 feet, total depth 3,628 feet, initial production 110 bbls.; No. 9 Peterson, top pay 3,558 feet, total depth 3,622 feet, initial production 20 bbls. in 30 minutes. Louisiana Oil & Refining Co.'s No. 7 Mayfield, top pay 3,617 feet, total depth 3,640 feet, initial production 27 bbls. in 15 minutes. Magnolia Petroleum Co.'s No. 6 Leverett, top pay 3,675 feet, total depth 3,728 feet, initial production 11 bbls. in 15 minutes.

Rector and Davis' No. 3 Brightwell, top pay 3,665 feet, total depth 3,684 feet, initial production 80 bbls. Rogers' No. 2-B Williams, top pay 3,630 feet, total depth 3,677 feet, initial production 25 bbls. in 30 minutes. Atlantic Oil Producing Co.'s No. 5-F Young, top pay 3,687 feet, total depth 3,745 feet, initial production 100 bbls. Boren Oil Co.'s No. 4 Stoddard, total depth 3,638 feet, initial production 20 bbls. in two hours, pumping; No. 7 Stoddard, top pay 3,555 feet, total depth 3,645 feet, initial production 20 bbls. in two hours, pumping.

Jenkins' No. 6 Camp, total depth 3,669 feet, initial production 10 bbls. per hour, pumping; No. 5 Camp, top pay 3,552 feet, total depth 3,666 feet, initial production 20 bbls. per hour, pumping. Delano Oil Co.'s No. 2 Cooper Neal, top pay 3,534 feet, total depth 3,612 feet, initial production 20 bbls. per hour, pumping. Gant-Garvin-Wegener's No. 13 Moore Estate, top pay 3,565 feet, total depth 3,615 feet, initial production 10 bbls. in two hours. Goodnight Oil Co.'s No. 4 Frederick Estate, top pay 3,538 feet, total depth 3,570 feet, initial production 10 bbls. per hour, pumping; No. 3 Frederick Estate, total depth 3,630 feet, initial production 20 bbls. in two hours, pumping.

Gulf Production Co.'s No. 10 Cashen, total depth 3,813 feet, initial production 60 bbls.; No. 7 Thrash, top pay 3,729 feet, total depth 3,739 feet, initial production 55 bbls. through three-quarters inch choke. Humble Oil & Refining Co.'s No. 36 Blackwell, top pay 3,644 feet, total depth 3,659 feet, initial production 62 bbls.; No. 4 Neal, total depth 3,707 feet, initial production 32 bbls. Hunt Production Co.'s No. 12 Reed, total depth 3,693 feet, initial production 22 bbls. per hour, pumping. Hunt, Sherman and others' No. 4 Frederick, total depth 3,695 feet, initial production 10 bbls. per hour, pumping. Londo Oil Co.'s No. 4 School Lot, total depth 3,810 feet, initial production 70 bbls. Lyons' No. 4 Moore Estate, total depth 3,600 feet, initial production 15 bbls. in 30 minutes.

McCutcheon's No. 2 Clay, top pay 3,506 feet, total depth 3,649 feet, initial production 10 bbls. in 20 minutes. Shell Petroleum Corp.'s No. 15-B Brook, total depth 3,729 feet, initial production 35 bbls. Stanolind Oil & Gas Co.'s No. 10 Millstead, total depth 3,770 feet, initial production 24 bbls. in 15 minutes; No. 9 O'Quinn, total depth 3,813 feet, initial production 27 bbls. in 24 hours. Sun Oil Co.'s No. 22 Knight, total depth 3,636 feet, initial production 65 bbls.; No. 4 Till, total depth 3,608 feet, initial production 20 bbls. Ward Oil Co.'s No. 8 Giles, total depth 3,711 feet, initial production 42 bbls.

Smith County

Alford, Deadon and Shaw's No. 1 Green, dry and abandoned at 4,153 feet. Texas Co.'s No. 15 Blackwell, total depth 3,695 feet, initial production 15 bbls.

Upshur County

Galvez Oil Co.'s No. 6 Moore Heirs, top pay 3,725 feet, total depth 3,728 feet, initial production 30 bbls. in 30 minutes. Gulf Production Co.'s No. 2 Ray, top pay 3,577 feet, total depth 3,581 feet, initial production 7 bbls. per hour. Phillips' No. 4 fee, total depth 3,704 feet, initial production 20 bbls. in 30 minutes. Snowden Oil Co. and others' No. 1 Mackey, total depth 3,732 feet, initial production 15 bbls.

PIPE LINE CONTRACTORS' CODE

George E. Matt, of Tulsa, secretary of the Associated Pipe Line Contractors, at a conference with N. I. R. A. officials in Washington, was given definite assurance that the pipe line construction code would be passed by the deputy administrator to the advisory board for final approval during this week. The code is being handled as Chapter 2-B 1 of the General Contractors' Code, and the pipe line contractors will have this chapter as their own when the final approval is given.

PETROLEUM ACCOUNTANTS

The October meeting of the Petroleum Accountants Society of Tulsa will be held Thursday, October 25, in the Winter Garden of the Mayo Hotel, at 6 p.m.

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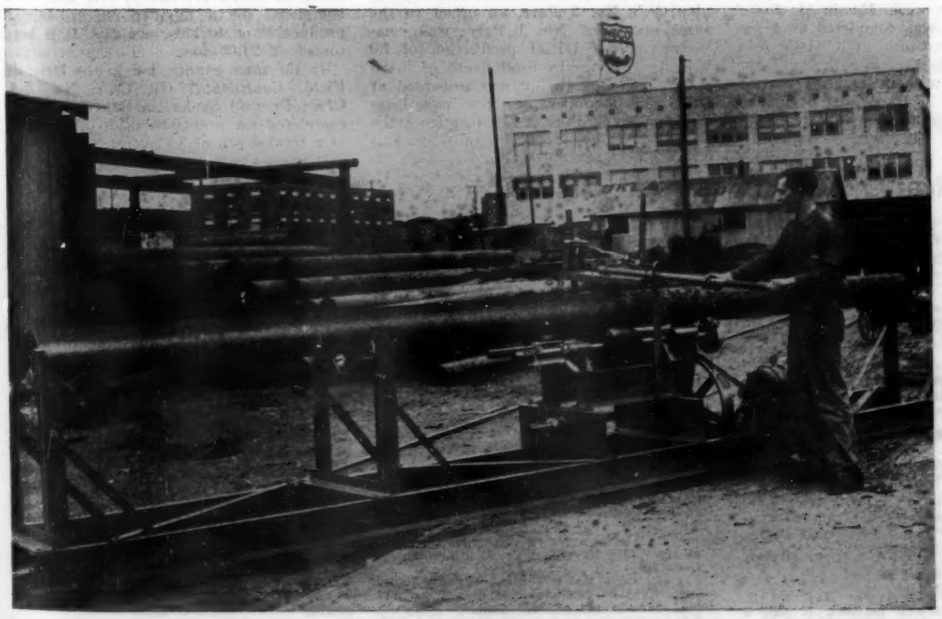

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Two Producers Extend the Sam Fordyce Field, Hidalgo County, Northwest and Northeast

SAN ANTONIO, Tex., Oct. 22.—The new Sam Fordyce Field, southwestern Hidalgo County, got its second and third producers during the week, extending production northwest and northeast. Heep Oil Corp.'s No. 1 Seabury, George and Taylor, about 1,500 feet northwest of the discovery in Tract 256, Porcion 38, was completed for an initial production of 36 bbls. of oil per hour through a three-eighths inch choke on the tubing, with working pressure 235 pounds on the tubing, and casing pressure 320 pounds. It is bottomed at 2,798 feet in sand topped at 2,788 feet. The operators are moving in material for No. 2 Seabury and others in the northwest corner of the same 26-acre tract. Moncrief and Showers' No. 1 Francisco B. Guerra, 1,500 feet northeast of the discovery in Tract 254, Porcion 39, was completed for an initial production of 4 bbls. per hour through a three-eighths inch tubing choke, with tubing pressure 1,000 pounds and casing pressure 1,125 pounds. The test is bottomed at 2,795 feet, the lower 10 feet being saturated sand and the upper 28 feet gas sand.

Due north of the discovery, Otto Wood's No. 1 Francisco B. Guerra, in Tract 254, Porcion 39, is due to be completed by the first of the week. It picked up the high pressure gas sand found in Moncrief and Showers' test, at 2,760 feet and was cored to 2,782 feet. From 2,782-2,800 feet a heavily saturated oil sand was cored. The operators are now testing at the total depth of 2,800 feet. It will no doubt extend production 1,700 feet to the north.

Lucky-Blocker and Bishop's No. 1 Guerra, also in Tract 254, Porcion 39, and 1,500 feet northeast of the discovery, has the appearance of making a well. It made a drill stem test at 2,747 feet and showed 450 pounds of pressure in five minutes. The gas sand was cored from 2,722-42 feet, the lower 5 feet of the hole being in shale. The operators are coring and expect to pick up the sand by the first of the week. Five other tests are drilling, with five more ready to spud. Otto Wood's No. 2 Guerra, only 600 feet north of the discovery and the nearest drilling offset, is expected to be the next test to core the sand. It is drilling below 2,500 feet. Other drilling operations include G. A. Clements' No. 1 Guerra in Tract 254, Porcion 39, about 1,200 feet north of the discovery and between Wood's Nos. 1 and 2 Guerra which is drilling below 1,125 feet. Otto Wood's No. 2 John Lawrence, in the southeast corner of the original Wood 40-acre drilling block, and about 1,200 feet southeast of the discovery, is drilling below 925 feet.

Southern Section of Field

In the southern part of the field, Alamo Drilling Co. is preparing to abandon its No. 1 Ed Sullivan, which tested salt water. It is bottomed at 3,009 feet. It tested salt water from 2,769-80 feet. To the west, Heep Oil Corp.'s No. 1 Teresa Flores which failed to pick up the pay horizon found in the discovery well is drilling below 3,000 feet and it is reported the operators will make this a deep test. Moncrief and Showers are rigging up on their No. 1 Guerra, east of the discovery in Tract 274, Porcion 39. Otto Wood has completed derrick for his No. 3 Lawrence, about 300 feet south of the discovery in Tract 274, Porcion 39. Navarro Oil Co. is moving in material for its No. 1 Seabury and others on a location in the north 25 acres of the southeast 51 acres of Tract 256, Porcion 38. This offsets Heep Oil Corp.'s No. 1 Seabury, a producer. About a mile east of the discovery, Danvers and Harrison and others are rigging up for their No. 1 Francisco B. Guerra, 330 feet from the west line and 330 feet from the south lines of the south 40 acres of Tract 12, Porcion 41, Ancient Jurisdiction of Reynosa. It is about 3,000 feet west of the old Chancellor-Hall wildcat in Porcion 42, which had a showing of oil in sand at 3,070 feet, and was abandoned several months ago.

In the eastern part of the county, Union Sulphur Co.'s No. 2 American-Rio Grande Land & Irrigation Co., a rank wildcat in Tract 2,082, Block 86, North Capisallo district, is drilling below 6,767 feet in hard shale and lime. It is north of the town of Mercedes. Another deep wildcat in the northern part of the county is getting under way. It is McCollum Exploration Co.'s No. 1 John C. Engelman, in Lot 3, Block 70, Las Mestenas tract. It is scheduled to be drilled to 5,500 feet, and the operators are waiting on cement to set after cementing surface casing.

Caesar Field

Luling Oil & Gas Co.'s No. 4 Ruhman, in the Caesar Field, northwestern Bee County, is preparing to cement casing after getting the Pettus sand from 3,050-60 feet. It has the appearance of making the best well in the field, and if a producer will extend production a half mile northeast. Mid-Continent Crude Oil Co.'s No. 2 Kimball, a short distance south of the Caesar Field in the Grauburg district, is shut down at 200 feet to lay a gas line.

West Tuleta

Mills Bennett and others' No. 1 Harris, in the West Tuleta Field, Bee County, is drilling below 3,000 feet. It is in the southwest extension area of the Tuleta Field. Two other wells were completed during the week. Edwin M. Jones' No. 3 Robinson was completed as a gas well in the Pettus sand at 3,910-36 feet, after the hole had been carried to the Yegua horizon, without results. Walton and Heard's No. 4 Rapp was completed for an initial production of 125 bbls. per day through choke. It topped the sand at 3,896 feet and was drilled to a total depth of 3,914 feet. Whisenant and Trenchard are drilling below 2,500 feet on their No. 1 Rapp, 330 feet out of the northwest corner of the Rapp tract, and have made location for No. 2 Rapp, 300 feet from the north and east lines of the tract. About 3 miles south of the field, George McMurray's No. 1 Ray, a wildcat, is drilling below 1,500 feet. Location is in the W. B. Blanchard Survey.

North Pettus

In the North Pettus Field, Sun Oil Co.'s No. 3 Scarborough was completed for a 200-bbl. well at 3,652 feet, with 400 pounds working pressure on the tubing and 600 pounds on the casing. It topped the sand at 3,641 feet. United Production Corp. is rigging up for its No. 47 Ray, as a west offset to the Houston Oil Co.'s Neihaus lease. A quarter of a mile south of the field, Hewitt and others' No. 2 Ray, was fishing at 4,100 feet for a lost drill stem.

Live Oak County

Lion Oil & Refining Co.'s No. 2 McNeil, in the McNeil Field, Live Oak County, just northeast of the discovery, missed the pay found in the discovery well and is drilling deeper, after being bottomed at 4,810 feet. Location is in Block 9. One and a half miles northwest of the discovery, Coquart and others' No. 1 Wade McNeil, a half mile northwest of the discovery, is drilling after cementing surface casing. Same operators' No. 1 Little, 1 mile northeast of the discovery, is drilling below 1,500 feet.

Duval County

On the Piedras Pintas Dome, Duval County, Tom Graham and Texon Royalty Co.'s No. 2 Parr, an offset to the same operators' No. 1 Parr, was completed for an initial production of 30 bbls. per hour at a total depth of 3,485 feet. Seven-inch casing was cemented at 3,475 feet. The operators have made location for No. 3 Parr, 2,170 feet from the north line and 2,250 feet from the east line of Survey No. 185. It is 150 feet south of No. 1 Parr.

Webb County

In the Bruni Townsite area, Cole Field, Webb County, American Liberty Oil Co.'s No. 1-B Bruni, east of the Bruni townsite, tested dry at 3,406 feet and is coring deeper. Herman Brown's No. 2 Bruni, in the same direction from the townsite, tested a little oil and gas on a drill stem test and is coring deeper. Sun Oil Co.'s No. 1 Bruni was testing a sand at 3,415-31 feet and is due to be completed by the first of the week. North of the townsite, Cole Petroleum Co.'s No. 86 Benavides, northwest of its No. 85 Benavides, a producer, was drilled to a total depth of 3,990 feet and was plugging back to 2,300 feet to test an upper sand. One new location was announced for the field. American Liberty Oil Co.'s No. 4-A Bruni is located in Survey No. 6 of the Foltz Subdivision of the Mariano Arispe grant.

Five more producers were recorded for the Government Wells Field, Duval County. Brown and Nessley's No. 2 Runnels, in Survey No. 62, was completed for an initial production of 100 bbls. per day from a total depth of 2,355 feet. Bridwell Oil Co.'s No. 2 Hahl, in Survey No. 250, flowed 2½ bbls. per hour from a total depth of 2,223 feet. Magnolia Petroleum Co. completed two wells. Its No. 37 Duval County Ranch in Survey No. 209, flowed 10 bbls. per hour through a three-eighths inch choke from a total depth of 2,340 feet. No. 8 J. O. Wilson was completed for an initial production of 100 bbls. per day from a total depth of 2,373 feet. Trapshooter Reilly Oil & Royalties Co.'s No. 2-B C. W. Hahl, in Block 27, Survey No. 250, was completed for a pumper for an initial production of 40 bbls. per day. It is bottomed at 2,365 feet.

In the same county, but in the Driscoll Field, Continental Oil Co.'s No. 3-A Clara Driscoll Sevier, in Survey 23, was completed for a 20,000,000-foot gas well at a total depth of 3,710 feet. It is northeast of two producers and extends the field a short distance.

Bexar County

Two wildcat locations were made for the eastern part of Bexar County. Just east of the Eckert Pool, O'Neil and others have made location for their No. 1 Salek Cherninvsky and are ready to spud in. It will test all the shallow formations and if it should fail to make a producer in any of those sands, it will be carried to the Edwards lime. The other test was made by Ricker, Auld and Bonner. It is to be drilled on the Phil French lease and is near the south central part of the north 1,000 acres of the French 1,600-acre tract.

Nueces County

Stanolind Oil & Gas Co.'s No. 2 Stratton, a wildcat in Nueces County, has been abandoned at 6,904 feet. It has been fishing at this depth for several months. Location is in Section 13 of the De Abajo grant.

Lavaca County

In the southern part of Lavaca County, Humble Oil & Refining Co. and Magnolia Petroleum Co. have made location for a joint wildcat in the southern part of Lavaca County. It is on the C. S. Wilson lease, 330 feet from the south and west lines of the tract in the A. Crenshaw Survey, 3 miles from the southeast line and 6 miles from the southwest line of Lavaca County. It is reported the Humble Oil & Refining Co. will drill a test northeast of the joint test.

Wildcat Operations in Southwest Texas

Week Ending October 20

BANDERA COUNTY

A. P. Crane & Co.'s No. 1 Watson, 988 ft. NE line, 926 ft. SE line, Sec. 71, Antonio Curvier Sur.
No report.

Plateau Oil Co.'s No. 1, Garrison Sur. No. 506, 1,500 ft. from N and 2,700 ft. from E lines of Sur. (8 mi. SW of Medina).
Drlg. 516 ft.

BASTROP COUNTY

Champion et al's No. 1 Charles E. Anderson, Antonio Navarro Sur.
Standing 850 ft.

BEE COUNTY

R. M. Herod's No. 5 Kimball, 810 ft. from E line, 150 ft. from N line of 110-ac. tract in S. Winship Sur.
Derrick.

Bill Hindeman's No. 1 Imogene Hall, 2,310 ft. along NW line of S½ of H. W. Fontaine Sur., thence at R/A 1,262 ft.
Rig moved off.

Wm. F. Morgan et al's No. 1 Hicks & Hall, Sec. 43 (Normanna area).
Building derrick.

Tuleta Oil Co.'s No. 1 George Ray, 330 ft. from E line, midway between N and S lines of George Ray 308.7-ac. tract in Blanchard Sur., 3 miles SW of Tuleta Field.
Drlg. 1,206 ft.; shale.

Hewitt et al's No. 1 Ray, ¼ mile S of the North Pettus Field.
No report.

Humble O. & R. Co.'s No. 1 Daniel Fox, 7,500 ft. from N line, 2,370 ft. from E line of 1,884-ac. tract in M. Fox Sur.
Drlg. shale 2,647 ft.

Mid-Continent Cruce Oil Co.'s No. 2 Kimball (Grayburg area).
T.D. 300 ft.; S.D.

Muenrio Oil Co.'s No. 1 E. M. Pruitt, 2,413 ft. from NE line, 330 ft. from SE line of J. A. Navarro Sur.
Moving in machinery.

R. J. Worthington et al's No. 1 Rutledge, 1,000 ft. from N line and 200 ft. from E line of A. Hadley Sur.
No report.

BEXAR COUNTY

Lloyd Bender's No. 1 Evans, 1,200 ft. from W line, 200 ft. from N line of 313.7-ac. tract in de la Garza Sur.
Standing 979 ft.

F. T. Chew's No. 1 C. S. Ogden & Brooks, 50 ft. E line, 2,500 ft. from Mitchell Lake, on 1,500-ac. tract, Irrigated farms.
S.D. 350 ft.

M. J. Crouch's No. 3 Hoch, 1,500 ft. N of Medina River, 300 ft. W of E line of 239-ac. tract and 1,250 ft. NE of No. 2 gas well.
Drlg. 776 ft.

Dr. Dickens' No. 1 Victor Golia, 150 ft. NW line and 150 ft. NE line of Cardines No. 25 Sur.
S.D. 530 ft.

Jones & Kieffer's No. 1 LaGrane, NW cor. of tract, 210 ft. each way, F. Rolen Sur.
Location.

Linda Oil Co.'s No. 1 Tomasi, Ignacio Peres Sur., 7,694 ft. NE along W line from SW cor., 450 ft. SE of NW line.
T.D. 1,452 ft.; tested sulphur wtr.; P.B. to sand 943-85 ft.

McFee & Briggs' No. 1 Lamb, 9,200 ft. from S line, 800 ft. W line, Manvel Deluna Sur. No. 2, Tract A. & B.
S.D. 1,065 ft.

Medina Oil Co.'s No. 1 Hendricks, 700 ft. S line, 400 ft. W line of 103-ac. tract, County Blk. 491, C. A. Yoakum Sur. No. 39.
S.D. 1,050 ft.

Ricker & Auld's No. 1 C. H. Kearney, 2,000 ft. from E line, 300 ft. from S of tank, Villapando Sur. No. 142.
Drlg. 1,256 ft.

BROOKS COUNTY

Cole Pet. Co.'s No. 1 Ulrich, 785 ft. E line,

(Continued on Page 34)

West Texas Fields

(Continued from Page 29)

4,265 feet, shot with 320 quarts from 4,-116-4,255 feet, initial production 370 bbls. Sinclair Prairie Oil Co.'s No. 1 Connell, top pay 3,439 feet, total depth 3,633 feet, shot with 320 quarts from 3,-460-3,630 feet, initial production 188 bbls. in 13 hours. Phillips Petroleum Co.'s No. 1 Texas Pacific Land, total depth 4,286 feet, plugged back to 4,256 feet, shot with 320 quarts from 4,090-4,256 feet, initial production 1,228 bbls. Continental Oil Co.'s No. 2-A Kloh, top pay 4,175 feet, total depth 4,253 feet, shot with 200 quarts from 4,155-4,255 feet, initial production 1,159 bbls. Sinclair Prairie Oil Co.'s No. 1 Wight, top pay 4,116 feet, total depth 4,270 feet, shot from 4,100-4,270 feet, initial production 605 bbls.

Fisher County

Roeser and Pendleton's No. 2 First National Bank of Waco, top pay 3,142 feet, total depth 3,150 feet, plugged back to 3,144 feet, treated, initial production 30 bbls., pumping. E. L. Smith Oil Co.'s No. 3 fee, top pay 3,103 feet, total depth 3,110 feet, treated, initial production 912 bbls.

Glasscock County

Steve Currie's No. 2 S. Turner, top pay 2,197 feet, total depth 2,200 feet, treated, initial production 1,560 bbls.

Howard County

Merrick and Bristow's No. 11 Robers, total depth 3,033 feet, initial production 240 bbls., 8 per cent b.s. and water.

Pecos County

Illinois Oil Co.'s No. 2 University, dry and abandoned at 1,915 feet.

Jones County

Clifton and Brazelton's No. 1 Coffey, dry and abandoned at 805 feet. Guthrie and Lancaster's No. 1-B Clay, dry and abandoned at 1,020 feet. Shaheen and others' No. 1 Bumpass, dry and abandoned at 2,148 feet. Capitan Oil Co.'s No. 1 Young, dry and abandoned at 2,-005 feet. Moutray Oil Co.'s No. 4 Hoyt, dry and abandoned at 1,985 feet.

Upton County

Theobotal Oil Co.'s No. 2 Lane, top pay 2,273 feet, total depth 2,290 feet, initial production 35 bbls., pumping.

Scurry County

Coffield and Guthrie's No. 1 Dodson, dry and abandoned at 3,653 feet.

Ward County

California Co.'s No. 13 Durgin, top pay 2,340 feet, total depth 2,559 feet, initial production 379 bbls. Farrell & Co.'s No. 6 Bennett, top pay 2,296 feet, total depth 2,546 feet, initial production 435 bbls. Richardson's No. 8-B Johnson, top pay 2,494 feet, total depth 2,582 feet, initial production 440 bbls.

Winkler County

Richardson's No. 3-F Scarborough, top pay 2,815 feet, total depth 3,020 feet, initial production 650 bbls.

PANHANDLE COMPLETIONS

Carson County

Texas Co.'s No. 4 Quinn, top pay 2,-975 feet, total depth 3,100 feet, shot 280 quarts from 3,015-90 feet, initial production 292 bbls., pumping. Texhoma Natural Gas Co.'s No. 2-M McLaughlin, top pay 2,218 feet, total depth 2,425 feet, initial production 47,100,000 feet of gas.

Gray County

Continental Oil Co.'s No. 6 Wright, top pay 2,780 feet, total depth 2,901 feet, initial production 1,507 bbls. per day on gas lift; No. 6 Smith, top pay 3,217 feet, total depth 3,268 feet, shot 150 quarts from 3,175-3,263 feet, initial production 547 bbls., pumping. Magnolia Petroleum Co.'s No. 8 fee, top pay 2,856 feet, total depth 2,990 feet, initial production 95 bbls. per day pumping. Skelly Oil Co.'s No. 15 East Schafer, top pay 3,170 feet, total depth 3,285 feet, shot 28 quarts from 3,173-3,285 feet, initial production 390 bbls. per day pumping; No. 11-A Webb, top pay 2,513 feet, total depth 2,618 feet, shot 120 quarts from 2,500-2,531 feet, initial production 194 bbls. per day pumping. Texas Co.'s No. 1 Barrett, top pay 3,210 feet, total depth 3,250 feet, shot 200 quarts from 3,132-3,232 feet, initial production 97 bbls. per day pumping.

Texwell Oil Co.'s No. 1 McConnell, top pay 3,140 feet, total depth 3,267 feet, initial production 79 bbls. per day pumping. Thorp and Dawson's No. 2-B Short, top pay 2,900 feet, total depth 3,041 feet, shot 230 quarts from 2,910-3,017 feet, initial production 374 bbls. Empire Gas & Fuel Co.'s No. 3 Cullen, top pay 3,-243 feet, total depth 3,300 feet, initial production 244 bbls. per day pumping. Humble Oil & Refining Co.'s No. 5 Jackson, top pay 3,064 feet, total depth 3,155 feet, plugged back to 3,005 feet, initial production 191 bbls. pumping. Sinclair Prairie Oil Co.'s No. 7 Moody, top pay 2,842 feet, total depth 2,957 feet, initial production 997 bbls. per day pumping. Skelly Oil Co.'s No. 16 East Schafer, top pay 3,170 feet, total depth 3,298 feet, initial production 243 bbls. per day pumping.

Hutchinson County

U-Tex Oil Co.'s No. 2 Ware, top pay 3,035 feet, total depth 3,105 feet, shot 280 quarts from 3,025-3,105 feet, initial production 380 bbls. per day pumping. Wasson, trustee's No. 2 Watkins, top pay 2,923 feet, total depth 2,995 feet, shot 350 quarts from 2,923-95 feet, initial production 233 bbls. per day pumping. Stanolind Oil & Gas Co.'s No. 4-C Ware, top pay 3,025 feet, total depth 3,-123 feet, initial production 161 bbls. per day pumping, after shooting.

Wheeler County

Ohio Fuel Co.'s No. 4 D'Spain, total depth 2,514 feet, initial production 387 bbls. oil per day and 6,000,000 feet of gas. Piney Oil & Gas Co.'s No. 2 Plummer, top pay 2,454 feet, total depth 2,-476 feet, initial production 44 bbls. per day pumping; No. 1 Rippey, total depth 2,150 feet, initial production 2,800,000 feet of gas per day. Skelly Oil Co.'s No. 7 Derrick, top pay 2,375 feet, total depth 2,530 feet, plugged back to 2,502 feet, initial production 462 bbls. per day pumping.

WICHITA FALLS DISTRICT

Archer County

Accumulative Royalty Corp.'s No. 1 Helm, dry and abandoned at 1,503 feet. Anderson's No. 9 Justice, top pay 1,074 feet, total depth 1,087 feet, initial production 50 bbls. Bridwell Oil Co.'s No. 8-A Green, top pay 1,143 feet, total depth 1,150 feet, initial production 20 bbls.; No. 16-C Oil Investment Co., dry and abandoned at 1,456 feet. Burns' No. 1 Ball, dry and abandoned at 691 feet. Continental Oil Co.'s No. 6-B Falls County, top pay 1,099 feet, total depth 1,110 feet, initial production 20 bbls. per hour; No. 7-B Falls County, top pay 1,125 feet, total depth 1,142 feet, initial production 15 bbls. per hour, swabbing. Continental Oil Co. and Cullum's No. 17 Falls County, top pay 1,106 feet, total depth 1,121 feet, initial production 14 bbls. per hour, swabbing. Everts Drilling Co.'s No. 2 Kemp Estate, dry and abandoned at 3,-971 feet. Justice Oil Co.'s No. 6 Justice, abandoned location. Harner's No. 7 Langley, top pay 953 feet, total depth 964 feet, initial production 200 bbls. Kimball and Wooten's No. 1 Williams, dry and abandoned at 678 feet. Maxson, Jr.'s No. 28-B Green, top pay 1,084 feet, total depth 1,096 feet, initial production 75 bbls. Perkins and Cullum's No. 14-B Falls County, top pay 1,133 feet, total depth 1,139 feet, initial production 12 bbls.; No. 24 Falls County, tilken, top pay 1,141 feet, total depth 1,161 feet, initial production 60 bbls. Tex-Ho Oil Co.'s No. 2 Bloodworth, dry and abandoned at 1,135 feet. Texas Co.'s No. 1 McCrory, dry and abandoned at 1,628 feet.

Montague County

Beck's No. 7 Davenport, top pay 1,692 feet, total depth 1,712 feet, initial production 20 bbls. Bridwell Oil Co.'s No. 5 Tucker, top pay 1,125 feet, total depth 1,128 feet, initial production 30 bbls.

Clay County

Goddard's No. 1 McAdams, abandoned location.

Cooke County

Mayfield's No. 1 Donald, dry and abandoned at 800 feet.

Jack County

Moss, Inc.'s No. 1 Power, dry and abandoned at 420 feet.

East Central Texas Wildcats

(Continued from Page 30)

Fair et al's No. 1 Rushing, 1,000 ft. SE of old hole, 1¼ miles SE of Whitehouse. Fishing 4,550 ft.

Paul S. Williams et al's No. 1 Dean, 820 ft. E and 730 ft. N of 100-acre tract in Denson Moore Sur., 1 miles NE of Bullard. Rigged up.

RED RIVER COUNTY

Bryant and Speer's No. 1 Jones, 300 ft. W and 150 ft. N of 67-ac. tract, J. Compton, 8 miles SE of Emory. Location.

UPSHUR COUNTY

Virgil Hodges et al's No. 1 J. M. Floyd, 330 ft. from NE cor. of 136-ac. tract, 4 miles N of Gladewater, Railroad Sur. S.D. 3,764 ft.

Lanier and Moore's No. 1 Vaughan, 330 ft. from S line and 330 ft. from W line of 100-ac. tract, 3 miles NW of Big Sandy. P. W. Standifer Sur. S.D. 1,042 ft.

VAN ZANDT COUNTY

Pete Corley et al's No. 1 Slaton, 160 ft. from W and 660 ft. from N lines of William Carlton Sur., 3 miles SE of Ben Wheeler. Rig.

Gillum and Allen et al's No. 1 A. T. Bass, 150 ft. from W line and 150 ft. from N line of 10-ac. tract. William Hart Sur. T.D. 4,267 ft.; skidding rig 200 ft. west.

Green and Winn's No. 1 Eaton, 330 ft. out of most westerly SW cor. of J. Wilson Sur., 2 miles SE of Martin. Location.

Hodges & Schwartz's No. 1 McKinsey, C of N and S lines and 150 ft. from W of 106-ac. tract, Wm. Daniels Sur. T.D. 1,235 ft.; show of oil here.

Martin & Evans' No. 1 Bryant, 433 ft. N of same operators' dry hole, Nacogdoches County School Land Sur. Rigged up.

Miller et al's No. 1 J. M. Palmer, 150 ft. from S and E lines of 69-ac. tract, Nacogdoches County School Land Sur. Drlg. 737 ft.

Paden and Olson's No. 1 J. M. Palmer, 200 S of No. 2 and 140 ft. from W line of tract, J. Goodman Sur. S.D. 1,288 ft.

M. Rouch et al's No. 1 Bearden & Palmer, 150 ft. out of SE cor. of 61-ac. tract. Nacogdoches C.S.L. S.D. 1,240 ft.

WOOD COUNTY

Alex Snyder et al's No. 1 T. Holmes, 200 ft. out of NE cor. of 122-ac. tract, 1¼ miles SE of Hawkins, A. N. McKnight Sur. 199. Coring 5,125 ft.

West Texas Wildcats

(Continued from Page 29)

dem, 440 ft. from S line and 440 ft. from W line, Sec. 34, Blk. 43, Twp. 1n. S.D. 280 ft.

Sunray & Llano's No. 2 Jones, 2,310 ft. from N and E, Sec. 6, Blk. 44, Twp. 3s. Cellar.

EDWARDS COUNTY

Harry Adams' No. 1 Holman, 1,650 ft. from N and 330 ft. from E, Sec. 22, C.C.S.D. &R.G.N.G. Sur. S.D. 540 ft.; show oil 520-25 ft.

EL PASO COUNTY

Mesa Oil Co.'s No. 1 Coronado Valley. S.D. 1,335 ft.

FISHER COUNTY

Merry Bros. and Perrini, Inc., et al's No. 1 Dean, 660 ft. from S and E, Sec. 2, Blk. R., W. E. Richardson Sur. Drlg. 2,260 ft.

Texas Co.'s No. 2 Daniels, 330 ft. from N and W, Sec. 194, Blk. 1, B.B.B.&C. Sur. T.D. 3,111 ft.; swabbing 100 bbls. oil and 80 bbls. water per day; set csg.

Texas Co.'s No. 1 First National Bank of Rotan, 330 ft. N and E of the NW cor. of Sec. 210, B.B.B.&C. Sur. T.D. 3,148 ft.; fishing.

GLASSCOCK COUNTY

John I. Moore et al's No. 1 J. S. McDowell, 1,980 ft. from N line and 660 ft. from E line of Sec. 22, Blk. 34, Twp. 2s, T.&P. Sur. Drlg. 5,312 ft.

Wahlenmaier Pet. Corp.'s No. 1 Boyd, 990 ft. from N and E, Sec. 9, Blk. 36, Twp. 4s, T.&P. Sur. Drlg. 1,240 ft.

HOWARD COUNTY

Fred Hyer et al's No. 1 Clay, 2,310 ft. from N and 330 ft. from E, Sec. 126, Blk. 29, W.&N.W. Sur. Drlg. 1,182 ft.

L. C. Harrison et al's No. 3 Texas Land & Mortgage Co., 2,310 ft. from E line and 330 ft. from the S line of Sec. 4, Blk. 30, Twp. 1s, T.&P. Sur. Derrick.

Illinois Oil Co.'s No. 1 Logan, 990 ft. from N line, 2,310 ft. from E line, Sec. 2, Blk. 30, Twp. 1s, T.&P. Sur. T.D. 2,890 ft.; swabbing 30 bbls. day.

Iron Mountain Oil Co.'s No. 1 Read, 330 ft. from E line, 330 ft. from S line, Sec. 46, Blk. 30, Twp. 1n, T.&P. Sur. S.D. 1,640 ft.

Mixon et al's No. 1 Capps & Lucas, 2,310 ft. from S and 330 ft. from W, Sec. 17, Blk. 33, Twp. 1n, T.&P. Sur. Drlg. 1,100 ft. (corrected).

Slagel's No. 1 Foster, 990 ft. from S and 330 ft. from W, Sec. 43, Blk. 29. Spudded.

IRION COUNTY

Melrose Oil Co.'s No. 1 J. D. Sugg, 1,700 ft. from the E line and 305 ft. from the S line of Sec. 25, Blk. 2, H.&T.C. Sur. S.D. 270 ft.

JEFF DAVIS COUNTY

C. M. Joiner's No. 1 Jones & Coffield, 770 ft. from N and 1,322 ft. from E, Sec. 8, Blk. 3, H.&T.C. Sur. Derrick.

JONES COUNTY

Choate et al's No. 1 Faver, 170 ft. from S and E of Subdiv., A. Thompson Sur. No. 20. Drlg. 1,722 ft.

Condor Pet. Co.'s No. 3 Sayles, 650 ft. from S and 330 ft. from W, Sec. 1, Blk. 20, T.&P. Sur. T.D. 1,660 ft.; set csg.

Hammer & Beam's No. 1 Sheppard, 1,302 ft. from N and 200 ft. from E of 160-acre tract, D. Minter Subdv. No. 53. Machine.

John Byram et al's No. 1 P. Jones, 300 ft. from S and 660 ft. from W of NW, Sec. 5, Blk. 15, T.&P. Sur. Flowing 60 bbls. day; T.D. 1,935 ft.

Richards et al's No. 1 Ransom, 300 ft. from N and E, Sec. 244, B. M. Clopton Sur. Spudded and S.D.

Southern Oil Co.'s No. 2 Cade, 330 ft. S and 990 ft. E in Sec. 17, Blk. 19, T.P. Sur. Drlg. 1,275 ft.

Texas Inland Oil Co.'s No. 1 Boaz, 330 ft. from N and W of N 311 acres of S 611 acres, John Wall Sur. No. 272. Drlg. 2,410 ft.

Texas Inland Oil Co.'s No. 2 Sellers, 660 ft. from N and 200 ft. from W. Wm. Delk Sur. No. 241. Drlg. 1,706 ft.

LOVING COUNTY

D. C. Evans' No. 1 W. D. Johnson, 2,310 ft. from N and 1,650 ft. from W, Sec. 18, Blk. 57, Twp. 1, T.&P. Sur. S.D. 2,630 ft.

PECOS COUNTY

Adams et al's No. 1 Schearer. Location.

Adams et al's No. 1 Masterson. Location.

California Oil Co.'s No. 24 Yates, 160 ft. from E line and 20 ft. from S line, Sec. 34, Blk. 194, G.C.&S.F. Sur. Drlg. 1,030 ft.

Cardinal Oil Co.'s No. 17-E Tippett, 150 ft. from E line of W half and 730 ft. from N of No. 5-E, Sec. 40, Blk. 194, G.C.&S.F. Sur. S.D. 484 ft.

Gulf Prod. Co.'s No. 2 White and Baker, 330 ft. from N and E of Sec. 42, Blk. 194, G.C.&S.F. Sur. S.D. 685 ft.

Gulf Prod. Co.'s No. 3 White & Baker, SE cor. of N half Sec. 4, Block 207, T.C. Ry. Sur. Location.

C. S. Messenger's No. 2 Rand Jones, 1,925 ft. from S line and 1,913 ft. from W line of Sec. 5, Blk. 9, H.&G.N. Sur. Drlg. 1,945 ft.

Trans-Tex. Oil Co.'s No. 1 Caldwell, 330 ft. from E line and 330 ft. from S line of Sec. 27, Blk. 40, Twp. 9, T.&P. Sur. Drlg. 1,222 ft.

REAGAN COUNTY

E. P. Kirschner and White's No. 1 W. A. White and McIntosh, 720 ft. from E and 800 ft. from N of Sec. 1,223, E.L.R.R. Sur. S.D. 3,165 ft.

Skelly Oil Co. et al's No. 1-D E. S. Grayson, 1,980 ft. from N line and 660 ft. from W line of Sec. 35, Blk. 3, University Land Sur. Drlg. 4,076 ft.

REEVES COUNTY

J. E. Cunningham's No. 1 Altman, 2,310 ft. from N line and 1,980 ft. from E line of Sec. 1, C. C. Wyatt Sur. S.D. 1,560 ft.

Hugo Freels' No. 1 B. Greenman, 330 ft. from NE line and 231 ft. from SE line of Sec. 21, Blk. 3, H.&G.N. Sur. T.D. 3,985 ft.

RUNNELS COUNTY

Agnew and Currie's No. 1 H. E. Wade, 2,640 ft. from N line and 330 ft. from E line of Sec. 24, Domingo Dias Sur. No. 592. Drlg. 2,205 ft.

Hall Oil Co.'s No. 1 Brevard, 160 ft. N and W in Subdiv. 31, D. Dias Sur. Drlg. 1,998 ft.

Melrose Oil Co.'s No. 1 L. P. Woods, 150 ft. from NE lines and 3,475 ft. from W line of survey, Willett Holmes Sur. No. 166. S.D. 1,429 ft.; to run csg.

R. Wells' No. 1 James, 396 from N and 650 ft. from E of James tract in Sec. 14, D Diaz Sur. S.D. 180 ft.

SCHLEICHER COUNTY

John M. Cooper et al's No. 1 Bert Page, 1,290 ft. from N line, 1,470 ft. from W line of Sec. 40, Blk. L, G.H.&S.A. Sur. S.D. 5,785 ft.

Humble Oil & Ref. Co.'s No. 1 Ike Honig, 2,640 ft. from N line and 2,650 ft. from E line of Sec. 38, Blk. M, G.H.&S.A. Sur. Drlg. 5,091 ft.; show oil 4,562 ft.

SCURRY COUNTY

Coffield & Guthrie's No. 1 Holliday, 2,320 ft. from N and 320 ft. from W, Sec. 130, Blk. 97, H.&T.C. Sur. Location.

STERLING COUNTY

John I. Moore's No. 1 McIntire, 660 ft. from S and E, Sec. 35, Blk. 23, H.&T.C. Sur. Drlg. 1,725 ft.

STONEWALL COUNTY

Merry Bros. and Perrini et al's No. 1 Williams, C SW of SW, Sec. 6, Blk. C, A.B. &M. Sur. Fishing 2,645 ft.

SUTTON COUNTY

Texas & Hesselman's No. 1 Mower, 1,980 ft. from S and W of Sec. 39, Blk. 5, T.W.& N.G. Sur. Rigged up standard tools.

TAYLOR COUNTY

Dunnigan Bros. et al's No. 2 Hunter, 850 ft. from S and 350 ft. from W of Subdiv. No. 14, Willis Sur. Fishing 1,977 ft.

TERRELL COUNTY

W. A. Sudderth's No. 1 Phelps, 2,157 ft. from N line and 2,482 ft. from the W line of Sec. 5, Blk. 4-A, G. W. Turley Sur. S.D. 5,635 ft.; C.O.

UPTON COUNTY

Gulf Prod. Co.'s No. 103 McElroy, 1,980 ft. from S and 660 ft. from W, Sec. 197, Blk. F, C.C.S.D.&R.G.N.G. Sur. Good show high gravity oil at 10,795-10,840 ft.; drlg. 10,882 ft.

Perry & Breeding's No. 1 Lane, 1,650 ft. from S line and 990 ft. from E line of Sec. 36, Blk. 1, M.K.&T. Sur. T.P. 2,310 ft.; drlg. 2,385 ft.

Williams & Williams Drlg. Co.'s No. 1 Robbins, 1,660 ft. from S and 1,900 ft. from E, Sec. 4, G.C.&S.F. Sur. S.D. 2,040 ft.

WARD COUNTY

Alexander's No. 1 Richter, 1,650 ft. from NW, 1,170 ft. from NE line of Sec. 27, Blk. 34, H.&T.C. Sur. S.D. 1,700 ft.

Bradford et al's No. 1 E. R. Allen, 660 ft. from NW line and 651 ft. from NE line, Sec. 11, H.&T.C. Sur. S.D. 500 ft. (corrected).

Cook Drlg. Co.'s No. 1 Wood, 330 ft. from NW and SW, Sec. 5, W. F. Stewart Sur. Drlg. 2,229 ft.

Plains Prod. Co.'s No. 1 J. J. McGregor, 660 ft. from SE line, 660 ft. from SW line, Sec. 169, Blk. 34, H.&T.C. Sur. Drlg. 3,122 ft.

Postellio & Caprito's No. 1 Purcell, 330 ft from NE and 990 ft. from NW, Sec. 17, Blk. 34, H.&T.C. Sur. Rig up and S.D.

Sageland Oil Corp.'s No. 2 Pure-Bennett 1,650 ft. from NW and 2,310 ft. from SW Sec. 16, Blk. 34, H.&T.C. Sur. Spudded and S.D.

Tex-Mex Pet. Corp.'s No. 1 Pure-Bray, 1,980 ft. from NE and 660 ft. from NW, Sec. 6, Blk. 5, H.&T.C. Sur. Machine.

WINKLER COUNTY

Harry Adams' No. 3 Scarborough, 990 ft from N line and 990 ft. from W line, Sec 2, Blk. 77, P.S.L. Sur. Location.

Jeffries et al's No. 1 Brown & Altman, 2,310 ft. from S and W, Sec. 6, Blk. B-5. Driving csg. 335 ft.

J. C. Maxwell's No. 1 Clapp, 1,980 ft. from N and 330 ft. from W, Sec. 37, Blk. 26, P.S.L. Sur. Driving csg. 185 ft.

R. S. Mathews et al's No. 1 Evans, 1,320 ft from N line and 1,320 ft. from W line, Sec. 46, Blk. 73, P.S.L. Sur. S.D. 110 ft.

Sid Richardson's No. 1 Hill, 1,980 ft. from E line, 660 ft. from S line, Sec. 18, Blk. B-11, P.S.L. Sur. T.P. 3,300 ft.; T.D. 3,132 ft.; drlg. plug.

Sid Richardson's No. 5-A Scarborough, 330 ft. from W and 190 ft. from S, Sec. 1, Blk. 22-C, P.S.L. Sur. Machine.

Sayre Oil Co.'s No. 1 Howe, Sec. 13, Blk. 26, P.S.L. Sur. T.D. 2,874 ft.; shut in for storage.

Skelly Oil Co.'s No. 1 Hailey, Sec. 25, Blk. B-11, P.S.L. Sur. T.D. 3,112 ft.; T.P. 3,105 ft.; recovered tools.

Southwest Texas Wildcats

(Continued from Page 32)

1,323 ft. S line of C.C.S.D.&R.G.N.G. Sur. 7. Standing 4,515 ft.; (contract depth).

CALDWELL COUNTY

Anderson's No. 1 Perry, 330 ft. SE and NE lines of 27-ac. tract, Giddeon Pace Sur. Drlg. 1,844 ft.

F. P. Hynes et al's No. 1 Tramwell, 750 ft. from SE line and 330 ft. from NE line of tract in Ester Berry Sur. No report.

Kurz Oil Co.'s No. 1 Kurz ranch fee, 4,600 ft. SW line and 4,300 ft. SE line of Barnard Kiekast Sur. Drlg. 3,539 ft.

F. Meyers' No. 1 Mooney, 250 ft. from road, 350 ft. from middle of SE cor. of 102-ac. tract, Seale Sur. Location.

Stanley Smith's No. 1 J. C. Copeland, about 4 miles SW of Lockhart and beyond the Mehana Estate. Setting up machinery.

DUVAL COUNTY

H. B. Grimm's No. 1 J. H. Briggman, 330 ft. from S line, 150 ft. from E line of Sur. 258. Location abd.

Grimes et al's No. 1 Fitzsimmons, 300 ft. S line and 150 ft. E line, Sur. 291. Cmtd. surface csg. 50 ft.

G. Stewart Smith-Jeffers Oil Co.'s No. 1 Garcia, 990 ft. south of N line, 330 ft. W of E line, Blk. 3, Jose Marcelo Hinojosa grant. Dry and abd. 5,258 ft.

O'Byrne & Jennings' No. 1 Benavides, 2,734 ft. from S cor. and 330 ft. from W line at right angles, Sur. 355. No report.

Tom Graham and Texon Royalty Co.'s No. 2 Parr, 2,050 ft. from N line, 2,550 ft. from E line, Sur. 185. T.D. 3,475 ft.; comp. flowing 25 bbls. hrly.

Mills Bennett Prod. Co.'s No. 1 D.C.R.C., 150 ft. N, 4,200 ft. E line of Sur. 192. Cmtd. 10-in. surface csg. 30 ft.

Stieren Oil Co.'s No. 1 J. P. Philp, 1,650 ft. S line, 990 ft. E line, Sur. 320. Drlg. rock 170 ft.

W. B. Stewart's No. 1 Juan Benavides, 3,752 ft. S of the most southerly N line and 330 ft. from SW line of Sur. 355. Drlg. 2,610 ft.

Texas Co.'s No. 1 G. W. Sutherland, making location in Sur. 503. Drlg. 2,248 ft.

Texas Co.'s No. 1 Tom Graham, 5,685 ft. N 65 deg. E and 1,130 ft. S 25 deg. E, W cor. Geo. Reynolds Sur. 572. T.D. 5,410 ft.; drlg.

EDWARDS COUNTY

Carter et al's No. 1 W. A. Miers, 990 ft. from N and E lines of Sec. 6, C.C.S.D.& R.G.N.G. Sur. S.D. 402 ft.

Will Olhausen's No. 1-B Turney, 660 ft. from W line, 1,632 ft. from N line of Sec. 176 C.C.S.D.&R.G.N.G. Sur. T.D. 495 ft.; sand's 225-40 ft. and 405-07 ft.; csg. 405 ft.

H. H. Sides' No. 1 Turney, C.C.S.D.&R.G.N. G. Sur. No. 144, 1,320 ft. N line and W line of survey. Standing 1,010 ft.

Harry Adams' No. 1 Holman, 1,650 ft. N line, 330 ft. from E line, Sec. 23, C.C.S.D. R.G.&N.G. Sur. Drlg. lime 545 ft.

FAYETTE COUNTY

Texas Seaboard Oil Co.'s (J. Elmer Thomas and Henshaw Bros.') No. 1 Glecker, 330 ft. SW and SE of N cor. of 98.5-ac. tract in Anna Powell League. S.D. 3,505 ft.; (contract depth).

FRIO COUNTY

Amerada Pet. Co.'s No. 2 Halff & Oppenheimer, begin at most easterly N cor. of John H. Gibson Sur. No. 16, thence SE along NE line of Sur. 2,100 ft., thence SW at right angles 800 ft. (4 mi. SW of Pearsall). Drlg. lime 9,390 ft.

GILLESPIE COUNTY

Ed L. Nixon's No. 3 Lindig, 13,694 ft. S line, 1,333 ft. W line, Maria Josepha Guerra Sur. No. 41, or 6 ft. S of No. 1. Drlg. 516 ft.

GOLIAD COUNTY

Oceanic Pet. Co.'s No. 1 Fromme, 1,500 ft S line, 1,200 ft. W line of 62-ac. tract in P. D. Dexter Sur., 10 miles N of Goliad T.D. 2,685 ft.; to set csg.

Jack Porter's No. 1 Mrs. N. Meyers, NW cor. of 404.54-ac. tract, 1¾ miles SW of Huisache. No report.

GONZALES COUNTY

Weinert et al's No. 1 A. Exilles, 3,240 ft. S line and same N of river and 150 ft. E line of tract, Ira Nash Sur. W.O. 3,751 ft.

GUADALUPE COUNTY

Danvers-Harrison et al's No. 1 Guerra (Delamater), 330 ft. out of SW cor. of 40-ac. tract, Blk. 12, Por. 41. Rig.

Diamond Half Oil Co.'s No. 1 Wm. Maiserhofer, 506 ft. from E line and 1,500 ft. from N line of 51.35-ac. tract in L. H. Peters Sur. Drlg. 1,825 ft.

L. E. Trout's No. 1 McKee, Green DeWitt Sur., SW Darst Creek. S.D. 1,200 ft.

HIDALGO COUNTY

Davis & Harrison's No. 1 Lula George, 300 ft. from S and 700 ft. from E lines of Tract 13, Porcion 41, Ancient Jurisdiction of Reynosa. No report.

McCollum Exploration Co.'s No. 1 John C. Engleman, 400 ft. S and W lines, Lot 3, Blk. 79, Mestenas Tract. Cmtd. surface csg. 600 ft.

Union Sulphur Co.'s No. 3 American Rio Grande L. & I. Co., 400 ft. from S and E lines of tract, Blk. 86, North Capisallo district. Drlg. shale 6,773 ft.

JIM HOGG COUNTY

John D. Norwood's No. 1 C. W. Hellen, 330 ft. N and W lines, Sur. 48. Drlg. 1,430 ft.

J. M. Shugart's No. 1 R. Holbien, 100 ft. from N line, 330 ft. from S line of Blk. 55, Sur. 17 of Holbien Subd., of Las Animas grant. Location.

JIM WELLS COUNTY

Plymouth Oil Co.'s No. 1 Cuero Cattle Co., 330 ft. from S and W lines of H.T.&B Sur. No. 7, 2½ miles W from Alfred. No report.

Smith & Storey's No. 1 Martha E. Ellworth, 330 ft. N and W from SE cor. of W half of W 426 acres of Stanley Welch Sur. Drlg. 3,920 ft.

KARNES COUNTY

California Oil Co.'s No. 1 J. C. Tom, Jr., 466 ft. each way from NW cor. of 6,525-ac. tract, Maria-De Jesus Y. Barbo grant. Drlg. shale 2,805 ft.

F. P. Hynes et al's No. 1 Swiercy, 2,650 ft. from NW line, 500 ft. from SW line of 100-ac. tract in Gasper Flores Sur. Drlg. 175 ft.

R. E. Ceseaux et al's No. 1 Tom Campbell, 330 ft. S and E cor. of farm and survey, J. R. Backer Sur., 13½ miles SW of Falls City. S.D. 1,254 ft.

KENDALL COUNTY

Walter Bradley's No. 1 Werner, John F. Torrey Sur. S.D. 919 ft.

W. R. Shanklin's No. 1 Seidenstick, 1,835 ft. from most easterly E line, 100 ft. from most northerly S line of Antonio Rodegues Chacon Sur. 257. S.D. 400 ft.

KERR COUNTY

Edmiston Oil Corp.'s No. 1 Whitworth, 1,160 ft. from S line and 1,338 ft. from E line of Sec. 1,429 of the H.E.&W.T. Sur. S.D. 675 ft.

Herbert Oil Co.'s No. 1 J. D. Witt, 13,200 ft. from N line, 1,200 ft. from W line of Sec. 1,922, Hamilton Sur. S.D. 1,896 ft.

Jeff Love and Eastland Oil Co.'s No. 5-E Jeff Love, 1,500 ft. SE of No. 1 and 1,580 ft. from SE cor. and 300 ft. from N line of Sec. 1,891. No report.

J. F. Morrissey et al's No. 1 F. A. Karger, 1,400 ft. from S line and 400 ft. from E line of survey, Sec. 1, B.S.&F. Sur. Drlg. lime 1,326 ft.

G. F. Schreiner's No. 3 Jeff Love, 1,444 ft. from W line, 1,194 ft. from S line of Sur., 660 ft. N and 100 ft. E of Evans & Gants' No. 1 Love, Martinez Sur. 1,594. Location.

LaSALLE COUNTY

Standard Oil Co. of D. C.'s No. 1 J. M. Martin, 300 ft. S and W lines of 648-ac. farm in Sur. 688. Drlg. 1,986 ft.

LEE COUNTY

Jas. E. Pederson's No. 1 Turner, David Hudson Sur. S.D. 6,330 ft.

LIVE OAK COUNTY

W. H. Helmerich's No. 1 Cartwright, 660 ft. from W line, 330 ft. from S line of Lot 16, Seale, Morris & Seale Sur. Location.

Henderson Coquat's No. 1 Jacob, 660 ft. from N and E lines of Tract 27, Charles E. Trapp Subd., of Everett & Henry Sur. T.D. 1,526 ft.; P.B. to 1,790 ft.; tested; S.W.; abd.

Henderson Coquat et al's No. 1 Robertson. Sec. 314. Drlg. 2,700 ft.

Henderson Coquat et al's No. 1 Little, 1,320 ft. NE of S cor. of M. M. Shipp Sur. and 330 ft. N of S line. Drlg. shale 1,521 ft.

O'Neil & Coquat's No. 4 Sanger. Dry and abd. 3,501 ft.

McMULLEN COUNTY

Armoil Prod. Co.'s No. 2 K. Martin, Sur. 459. Location.

Beer-Witherspoon's No. 1 Ezzell, 330 ft from N and W lines of 40-ac. tract in Fant & Fadden Sur. Location.

Boling's No. 1 Brown, 1,500-ac., NW Crowther field. Location. Contract calls for 1,000 ft. test

H. K. Boysen's No. 1 Haglst, 990 ft. S, 330 ft. W of NE cor. Sec. 10, H.&T.C.R.Y. Sur. Spudded in.

Circle W Oil Co.'s No. 1 Wheeler, NW cor. Sec. 44, of Two Rivers Ranch Subd. Coring 1,165 ft.

Choate & Noble's No. 1 Miles, 330 ft. from S line, 2,750 ft. from E line of 1,250-ac tract in Stephens Sur. Location.

Encino Oil Co.'s No. 1 Walker, 1,200 ft. from N and W lines of 2,569-ac. tract. Sur. 128. Drlg. shale 2,111 ft.

W. W. Kelley's No. 1 Tom Walker, cor. of Surveys 106, 182, 23 and 104. Rigging up.

C. C. Shumway's No. 8 Shiner. Rig up.

Charles Wuest's No. 1 Fisher, Roderick O'Boyle Sur. Derrick.

Hy Yound's No. 1 Callihan, James Gardner Sur., NW cor. Blk. 4, Sec. 6. Derrick.

MEDINA COUNTY

C. M. Peacock's No. 1 Odem, 160 ft. from W line, 200 ft. from S line of Castro Sur. No. 173-174. Location.

Scoggins & Sanders' No. 1 L. W. Burrell, 150 ft. from E line, 1,750 ft. from N line of M. E. Gage Sur. 395. Drlg. 1,725 ft.

NUECES COUNTY

Buff Pet. Co.'s No. 1 Vincent Bluntzer, 660 ft. N line, 660 ft. E line of Share 7 of Bluntzer Subd. Rigging.

Clymore Oil Co.'s No. 1 Palo Alto Farms, 2,640 ft. from N and E lines of Sec. 183 of Bishop Subd. Derrick.

Stanolind O. & G. Co.'s No. 3 Stratton, 1,980 ft. from N line, 660 ft. from W line of NE Sec. 13, DeAbajo grant. T.D. 6,904 ft.; abd.

Texon Royalty Co.'s No. 1 Robert Driscoll, 330 ft. from N line, 5,697 ft. from W line of 880-ac. Driscoll tract and E of Simmons & Perry tract. Rig up.

REAL COUNTY

H. J. Heartwell et al's No. 1 L. J. Haby, 494 ft. from W line and 2,153 ft. from S line of A.B.&M. Sur. No. 175. Fishing 2,837 ft.

SAN PATRICIO COUNTY

Allied Minerals' No. 1-A Ramsey, 466 ft. E, 330 ft. N of SW cor. of the North B. Giddings Sur. on a 1,000-ac. tract. Reaming at 1,900 ft.

Lonnie Glasscock's No. 1 M. F. Timmons, 330 ft. out of SE cor. of Blk. 27, San Patricio townsite. Rigging up.

Gum Hollow Oil Co.'s No. 1 J. G. Willacy, 2 mi. W Portland. Drlg. 5,000 ft.

STARR COUNTY

Cooper & Andrews' No. 1 J. M. Martinez, SW cor. Sec. 135. Location.

C. R. Borah's No. 1 A. Guerra, San Jose grant, 320 ft. from N and 150 ft. from E line of Sec. 6 (NE part of county). Drlg. shale 1,882 ft.

E. P. Evans' No. 1 Kelsey Bass, 320 ft. N of State Highway 4, Sec. 7, Subd. Porciens 75,76 and 77. Drlg. shale 1,367 ft.

C. L. Smith et al's No. 1 J. M. Longfellow, 320 ft. out of NW cor. of Sur. No. 281. Set csg. at 985 ft.; in wtr. well.

Heep Oil Co.'s No. 1 Guerra, 320 ft. from NE and SE lines of Blk. 36, J. N. Crawford Subd., Porcion 56, Jurisdiction of Mier. Location.

R. M. Mitchell's No. 1 Kelsey Bass, 150 ft. from N line, 1,150 ft. from E line, Share 5, Por. 75. Location dropped.

R. M. Mitchell's No. 1 Seabury, 4,000 ft. from N line, 150 ft. from E line of Share 5, Por. 75, Camargo. T.D. 210 ft.; dropped from report.

Smith & Weston's No. 1 M. M. Garcia, Blk. 9, Sur. 905. Location.

Sun Oil Co.'s No. 1 Gonzales & Clark, 600 ft. out of NW cor. of NE Sec. 372, T.T. Ry. Sur. No. A-773. Drlg. shale 2,704 ft.

United Prod. Co.'s No. 1 Guerra, 36, 170 ft. from NE line, 1,521 ft. from NW line of Porcion 55. Drlg. hard shale and rock 677 ft.

E. L. Younkin's No. 1 Kelsey Bass, 330 ft. from S line, 7 ft. from W line of Blk. 19 in Porcion 87. T.D. 1,815 ft.; prep. to run D.S. test.

TRAVIS COUNTY

Marts & Beavens' No. 1 Emil Bloomquist, 150 ft. from NW line and SW line of 99¼-ac. tract in Peter C. Harrison Sur. S.D. 1,300 ft.

UVALDE COUNTY

Humble Oil & Ref. Co.'s No. 1 R. L. Anderson, 7,450 ft. SW of NE line and 9,100 ft. SE of NW line of J. J. Guerra Sur (3 mi. NE of Uvalde). Drlg. shale 4,494 ft.

T. T. Word's No. 1-B Truelove, 45 ft. E of No. 1-A. No report.

WEBB COUNTY

W. W. Lincoln's No. 1 M. B. Volpe, 3,300 ft. N, 150 ft. W line of Sur. 2,011. Drlg. 900 ft.

W. P. Morris' No. 1 A. M. Bruni, 994 ft. NW line, 943 ft. NE line, Blk. 65, G. M. Brown Subd, Saltea pasture, in J. V. Borrego grant. Sand 1,305-55 ft.; S.D. 1,385 ft.

Fidelity Exploration Co.'s No. 1 Soldivar, 1,300 ft. from E line, 2,600 ft. from N line of Sur. 657. T.D. 3,014 ft.; coring.

WILLACY COUNTY

W. W. Silk's No. 1 Stillman, Lot 18, Blk. 30, Santa Rosa Subd., Share 44. No report.

WILLIAMSON COUNTY

Johnson & Ray's No. 1-A Mary Smith Oxford, 350 ft. S, 40 deg. E of No. 1, Williams Sur. T.D. 270 ft.; drlg.

Mann & Rees et al's No. 1 F. Rees, John Bevil Sur. 56. T.D. 915 ft.; drlg.

T. J. McConnell's No. 1 J. R. Nazier, 150 ft. from S line and San Gabriel River and 150 ft. from E line of 124-ac. tract in Zarso Sur. No report.

J. Morgan Russell's No. 1 Nelson Est., 150 ft. S line and 1,115 ft. E line of J. L. Justin No. 2 Sur., 5 miles S of Georgetown. T.D. 755 ft.; drlg.

Stalley & Caffy's No. 1 A. J. Nelson, 350 ft. from SE line and 150 ft. from NE line of Barney C. Love Sur. Drlg. 205 ft.

WILSON COUNTY

Ray Oil Co.'s No. 1 J. M. McDaniel, 1,700 ft. from SW line, 350 ft. from NW line of 193.5-ac. tract in Concepcion Bestelio Sur. No. 9. No report.

J. C. Yancey's No. 1 Lyssy, 300 ft. from SE and SW lines of lease in D. J. Holt Sur. T.D. 1,600 ft.; S.D. in shale.

ZAPATA COUNTY

C. C. Crews' No. 1 M. D. Slator, 2,111 ft. from SW line, 1,980 ft. from SE line of Blk. 1, Mission Oil Co. Subd. of Slator ranch, Borrego grant. T.D. 1,739 ft.; standing.

Danvers & Harrison's No. 1 M. J. Vela, 681 ft. NE line and 300 ft. NW line, or 3,140 ft. E line and 350 ft. N line of Por. 38, Blk. 7, Bela Subd. T.D. 1,603 ft.; standing.

J. W. Edwards' No. 1 D. A. McAskill, 150 ft. from N and E lines of Blk. 62, J. W. Edwards Subd. of 4,063.6-ac. tract out of Corralitz Subd. of the J. V. Borrego grant. Drlg. 637 ft.; 16-in. at 25 ft.

Merle Gunby's No. 3 Alice D. Haynes, 200 ft. SE and NE lines, Blk. 9, Haynes Subd., Comitas and Villa grant. T.D. 1,195 ft.; drlg.

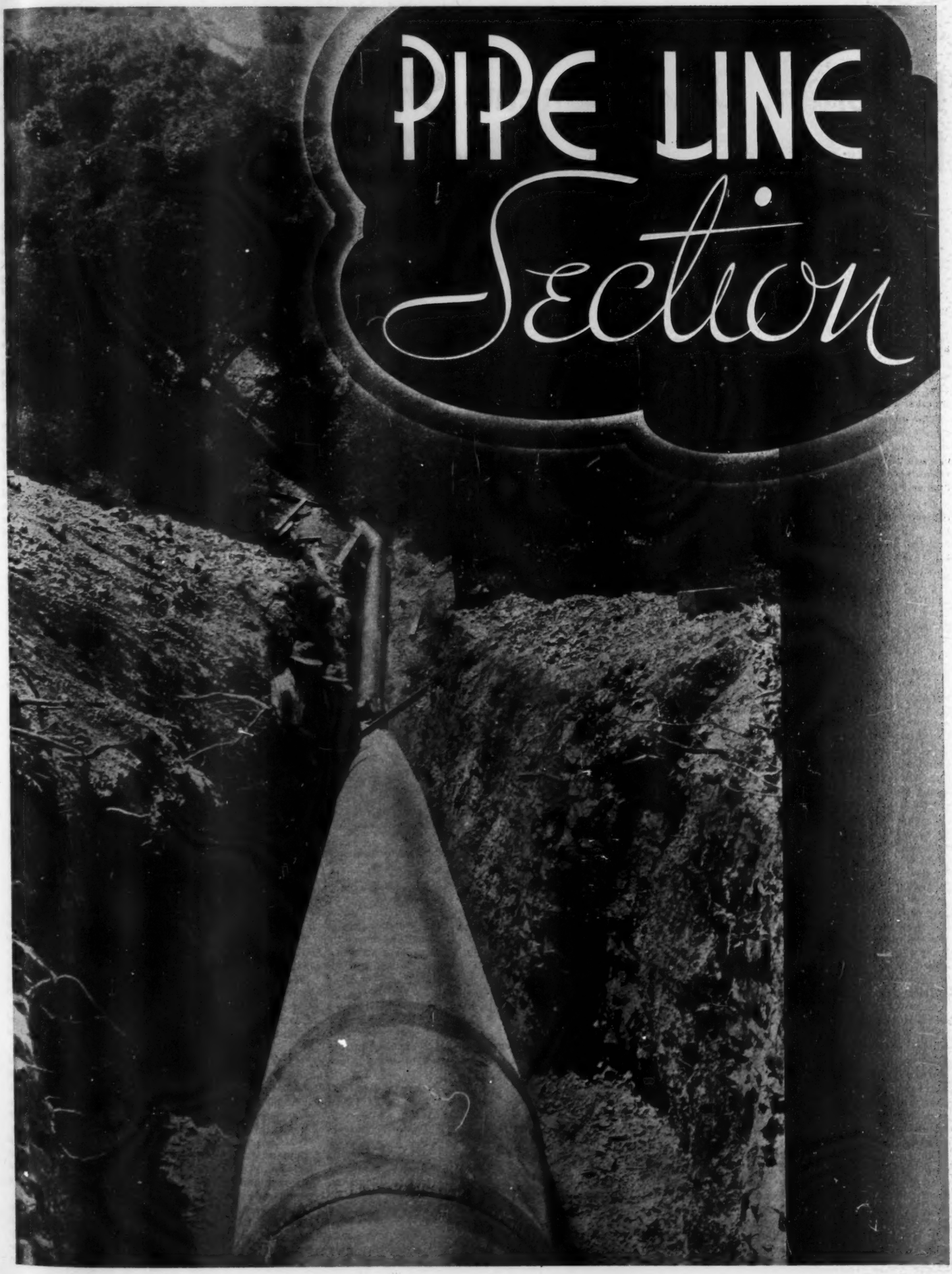
H. & M. Drlg. Co.'s No. 1 Slater, 614 ft. from SW line, 150 ft. from SE line, Blk. 65, J. B. Barrego grant. T.D. 22 ft.; standing.

H. V. & W. Oil Co.'s No. 1 Cuellar, 150 ft. NE line and 450 ft. SE line of Blk 3, Sur. 3, Pappas Subd., Por. 34. T.D. 1,125 ft.; standing.

Howell Muckelroy's No. 1 Filemn Flores, 77 ft. from SE line on NE line Lot 2, Blk. 39, Por. 37. Derrick.

Joe Palmer's No. 11 S. Vela, 330 ft. from NE and SE lines of Blk. 176, Share 4 of L. Grillo grant (3 mi. E of Redondo Pool). Drlg. 1,120 ft.

E. P. Wells' No. 1 S. E. Garcia, 150 ft. from N and E lines of 200-ac. tract in Pedernal grant. Moving in rig.


PIPE LINE
Section

Important Developments Show Constructive Progress in Oil Pipe Line Operation

By WILLIAM G. HELTZEL
General Superintendent, Stanolind Pipe Line Co.

During the period of 1927 to 1931 revolutionary changes occurred in the methods and practices which had been used for years by the pipe line industry with few or no deviations. In this short time higher tensile strength seamless and electrically welded, plain-end pipe in 30 to 40-foot lengths and of thinner walls was introduced for new pipe line construction to replace gradually the low-carbon, lapweld, screw and coupling pipe in 20-foot lengths which had been used for years.

The advent of this new type of pipe made possible the use of larger diameters for high-pressure work and consequently more economical design and operation for new trunk lines came about. This advantage appeared in the new trunk lines built during these years.

Oxyacetylene welding had been used in pipe line construction, but the introduction of the seamless and electrically welded pipe encouraged and brought about almost the exclusive use of welding for trunk lines. The use of longer joints of pipe and consequently greater weights in each joint necessitated the use of tractors and other heavy equipment in the construction of lines, and, at the same time, the replacement of the screw and coupling joint presaged the abandonment of the hand tools which had been used so long that they had almost become symbols of the industry.

Other Advances Made

This period marked the beginning of the use of electrical welding for pipe line work. Its principal application was in the patching, half-soling, and spot welding of badly corroded pipe in lines which could not be taken out of service. It became a common practice to use electrical welding for putting sleeves over leaking couplings and installing casings over whole lengths of pipe. Electrical welding filled an urgent need in the industry for which oxyacetylene was not adapted. Although the electrical welding was especially adapted for repairing lines which were filled with oil, it had the disadvantage at that time of not being adapted for the welding of butt joints without a back-up or chill ring and consequently there came into use such joints as the bell and spigot or the double joint with special chill or back-up rings.

Forged steel flanges and short radius bends were offered to the industry at this time to replace the heavy cast iron fittings which were not only unreliable, but always subject to leakage.

The trend to the use of plain-end pipe for welding brought about the development and use of the oxyacetylene cutting and beveling machine for trimming and beveling second-hand screw pipe which was being salvaged for use in new lines.

Investigation revealed that the leakage of gas from wooden-roof storage tanks and the sparking between the sheets or other parts of the tank during electrical storms was the cause of most tank fires. The all-steel welded roof came into use and has almost eliminated tank fires. The floating roof had come into use and was being rapidly extended to reduce evaporation losses.

The enormous flush production of the Greater Seminole Field found many pipe line companies without sufficient capacity to handle the production from the field and the centrifugal pump and electrical motor came into extensive use for high pressure service in booster or relay stations.

Up to this time the oil engine installation was rather slow and expensive. The machinery was heavy and cumbersome. The field gathering station was complicated as compared with the simple installations of today. It was during this period that the heat exchanger (making use of the crude oil pumped as a cooling medium) was tried out in closed cooling systems for Diesel engine installation. This use of the heat exchanger was one of the outstanding developments of this period and it paved the way for the use of Diesel engines where there was either poor water or a lack of supply. It made possible also the simplification of Diesel engine installations for both trunk and gathering line stations. The same development eliminated many problems in the operation of the Diesel engine.

Progress Continues in Recent Years

Near the end of this period higher speed and lighter weight engines were being tried. Valuable information was being obtained from studies of corrosion of the underground pipe line systems. Researches on pressure surges in pump discharge lines revealed the cause of the failure in these lines. In the field gathering systems in flush oil fields the steam pump was giving way to the use of portable gas or gasoline-driven pumping units for pumping the oil from the lease tanks to the first receiving station.

Important developments, even though fewer and less radical than in the previous three years, have occurred in pipe line practices since 1931, either as the result of economic circumstances or the natural extension of the groundwork laid in the previous three years. The high-speed light-weight Diesel engine geared to a centrifugal pump has come into use in competition with electrical motor for field gathering station service.

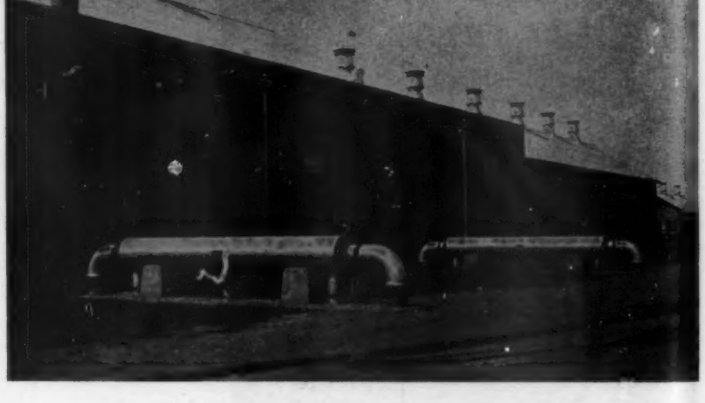
There has been a marked simplification in field pumping station installations. The use of the multicylinder gas engine or light-weight portable Diesel has minimized the risk of making large investments in field gathering stations before the oil production in the field warrants it. This type of equipment has made it possible to take care of the initial oil production from a newly developed field at a minimum investment. The same type of equipment is being used in the field gathering systems instead of steam pumps. The heat exchanger for cooling the water of the internal combustion engines is being used for small field installations as well as large trunk line engines.

There is a definite trend to the use of electrical welding rather than riveting for the smaller steel storage and pipe line working tanks. It is common practice to construct tanks of 20,000 barrels capacity by electrical welding. There have been larger tanks constructed entirely by electrical welding. An important development has been the adaption of electrical welding for butt joints in pipe line construction.

In oxyacetylene welding the introduction of the multiflame welding torch has speeded up this type of welding. There has been marked improvement in both the electrical and acetylene welding rods as well as the technique of each type of welding which has resulted in a considerable reduction in time and cost. Electrical welding has made it possible for pipe line companies to keep in service many miles of pipe lines by welding couplings, patching, and spot welding, rather than shutting down and draining lines for pipe replacements. At the same time the accumulation of temporary repairs, such as saddles, stuffing boxes, and leak clamps can be kept at a minimum. Special safety precautions are being developed to protect the workmen.

The use of forged steel flanges, short radius bends, tees, swedges, caps, etc., is established and consequently the heavy cast iron fittings are being gradually displaced in service and junked.

Remarkable improvements have been made in pipe line construction equipment, which have facilitated the laying of lines. The development of special equipment has made it possible to apply good pipe line coatings in the field. The oxyacetylene cutting and beveling machine has been improved so that good and true bevels can be made on second-hand pipe for welding. The hand tools for larger pipe which were used previous to 1931 have remained idle in warehouses, but gradually they are being junked. A few such tools are kept for an occasional job requiring such hand tools. The improvement in roads had made it possible and the requirement of the NRA codes in the employment of men has made it necessary to replace the heavy low-speed trucks with lighter and faster motor transport. Pipe line bridges are being used advantageously for crossing creeks where pipe replacements are frequent or where there is risk of losing the lines in the creeks on account of floods or slides of the creek banks.



Completed heat exchanger units at pipe line station

Orifice meters are being used to advantage at trunk line and field stations to check pressure drops before going to the expense of covering the lines. The meters aid in eliminating unnecessary shutdown time on account of pressure drops. There has been a large reduction of pipe line warehouse stocks.

More careful consideration is being given to the duplication of gathering systems in new declining oil fields with the result that a large amount of second-hand pipe is being reclaimed by the various companies for use in newly constructed lines.

On account of the reduction in welding costs in the past few years, it is found profitable to salvage large amounts of pipe which was disposed of previously to dealers in second-hand pipe. The abandonment of field gathering stations has resulted in

the accumulation of obsolete pumps, engines, and auxiliary equipment which cannot be used economically for new installations.

Telephone repeaters are being used to improve communications on some of the longer telephone systems of pipe line companies. New methods have been developed for draining trunk oil lines for cutting and making repairs without the customary large losses of oil and the concomitant damages.

An undertaking of one pipe line company to modernize a part of its trunk line system in the Mid-Continent area during the earlier part of this year is noteworthy and will be discussed in more detail.

Notwithstanding the fact that there has been only a small decrease in the consumption of its products during the past three years the oil industry has been under an economic distress as the result of heavy taxes, an oversupply of oil, unfair competition in marketing, and increased labor and material costs which have put certain economic pressure on transportation rates, resulting in reductions of tariffs to meet the conditions. The effect of the reduction in pipe line tariffs will be felt more poignantly with the decline of the flush fields and as it becomes necessary to extend or use the existing trunk line laterals and gathering systems in more remote and scattered areas. Greater efficiency in operation, reduced maintenance costs and the partial elimination of duplicated facilities in the declining oil fields will be required to meet this trend.

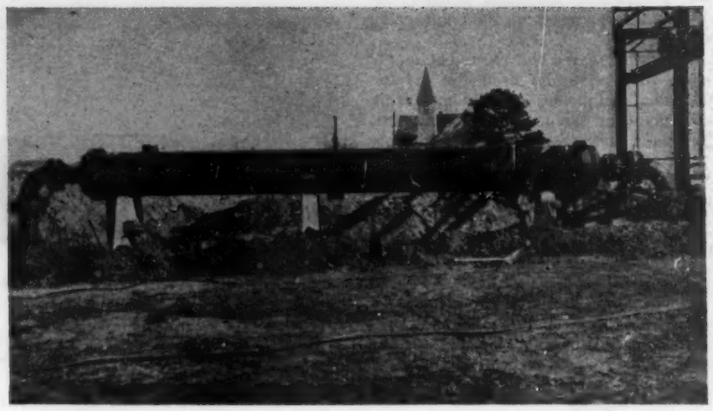
It seems illogical to predicate the cost of gathering and transporting oil in the future on the basis of the industry's experience in gathering oil from prolific flush pools which have been explored and developed in areas reasonably near the various trunk line systems. In this connection it should be borne in mind also that heavier maintenance costs must be met by the pipe line companies since their systems are becoming older.

Expansion of Trunk Lines

There has been no appreciable expansion in trunk lines in the Mid-Continent and Gulf Coast areas since 1932, and only a few extensions have been made in the gathering systems on account of the prolific flush Oklahoma City and Texas Pools. It appears that the trunk line systems are adequate in capacity and one cannot anticipate any large construction programs for increasing the capacities of the present trunk line facilities. East and West Texas, as well as the Panhandle, appear to be adequately served with tributaries to the trunk lines. Developments of oil fields in western Oklahoma would necessitate the building of some lines in that direction. A reasonable expansion of pipe line facilities in Kansas during the next two or three years can be expected.

The history of the oil pipe line industry in the Mid-Continent and Gulf Coast areas has been marked by continuous expansion of its trunk and gathering line facilities. Continuous changes will occur in the gathering systems on account of the decline of old fields and the development of new pools which will require in addition to the building of new gathering systems the extension of lateral or tributary lines from the trunk lines to the new fields. Undoubtedly the attention of the pipe line engineers and executives will be shifted from large construction programs to the planning for more efficient operation and ways of meeting approaching obsolescence and heavier maintenance schedules. It must be remembered that the present average age of many of the pipe line systems in the Mid-Continent and Gulf Coast areas is less than 15 years. Some of these systems are reaching that age at which a surprising amount of obsolescence has set in and unexpected maintenance costs must be met. It is true that some of the older pipe line systems are still operating with their original equipment and lines (this is the case for some of the older eastern lines) with a reasonable amount of maintenance expense. The maintenance schedules of some of the older lines cannot be used in planning for a maintenance schedule for the systems which must be kept up to capacity, because most of the older lines referred to above have spare line capacity and machinery. It is logical to believe that important developments will occur in the field of economical operation in the next three years which will be comparable to the progress made in the past three to six years in improving equipment, machinery, lines, and practices.

Considerable obsolescence has already occurred in lines and machinery for both field and gathering trunk line systems. The light-weight portable multicylinder gas or gasoline engine has replaced to a large extent the customary steam power. Usually these units are connected to various sizes of pumps by a V-belt drive. The use of this type of unit has been found more economical than the payment of 1 cent a barrel to the producer for steam.



Installation of heat exchanger unit

Another advantage over the steam pump is that such a unit can be set at a strategic point in the field to gather the oil by gravity from the lease tanks, which reduces the loss of oil which occurs in multiple steam pump settings and avoids the rather heavy maintenance expense on a large number of steam pumps. These units are adapted for pumping 400 to 500 barrels of oil per hour at pressures as much as 300 to 400 pounds. This use of the portable internal combustion engine has made the steam pump almost obsolete in the new field gathering systems where the oil can be collected by gravity.

It is not an uncommon experience now to find that there is no power available for pipe line pumping after the contractor completes the well and moves the boilers away. In some cases the wells are drilled with internal combustion engines. If the well flows naturally there is no occasion for the producer to have a continuous supply of power on the lease and consequently the pipe line company must supply a self-contained power unit for its use.

On account of these conditions the industry is in need of a small medium-priced pumping unit capable of pumping 40 to 50 barrels per hour at 200 to 300 pounds pressure to take care of the production of small wells which are brought in from time to time in somewhat scattered or isolated areas. An investment in the larger pumping units is not warranted.

The use of the air or gas lift is a factor also which has influenced the pipe lines in the use of a portable internal combustion unit. An advantage of such a unit also is that it is not necessary to depend on the producer for power which is not always available. This same type of internal combustion engine and pumping unit is being used advantageously as a simple and inexpensive installation in newly developed fields to handle the first production, which eliminates the risk of making a heavy investment in a field gathering station before it is warranted.

Previous to the use of this type of portable unit, it was customary to build a field gathering station soon after the first wells came in. Such an installation involved heavy and cumbersome machinery, large concrete foundations, water-cooling systems, station lines, buildings, communication systems, crude oil tanks, etc.

Collar sleeve welding jig on line

Before adoption of the proration system oil fields were developed rapidly and the wells were allowed to flow at full capacity, which placed on the pipe line companies the responsibility of handling large volumes of oil at the start and consequently the pipe line facilities were built to meet unexpected or unforeseen conditions. Proration of the new oil fields along with the development of lighter weight and higher speed machinery has made it possible for the pipe line companies to limit their risk in investments in new oil fields.

In entering a new oil field the pipe line company will probably lay a limited amount of gathering gravity line between the producing lease or leases and the portable gas or gasoline pumping unit which will take the oil directly from the lease tanks and pump it directly to the nearest established receiving stations. If the field grows and promises good production other portable units will be added to run the oil by gravity according to the topography until the amount of production warrants the building of a central receiving station in the field to operate at high pressures in relaying the oil to the trunk line or other intermediate stations. In case of large production on individual leases, such a portable pumping unit as described will be assigned to the individual lease, which is a customary practice today in flush fields.

With the development of this type of pumping unit pipe line engineers are giving more careful consideration to the expense of laying large diameter gravity lines. It is the opinion of some pipe line men that it is more economical to make use of the portable pumping unit in gravity zones and lay a discharge line rather than a gravity line between the field and the central receiving station.

The new field gathering station installations will be simple as compared with the stations built 10 years ago. Although there are plenty of second-hand engines and pumps available for such installations it will not be economical to make use of such heavy and cumbersome equipment. The accompanying table shows that the older slow-speed engines weigh from five to nine times as much per brake horsepower as the modern high-speed engines:

COMPARATIVE WEIGHTS OF RECENT HIGH-SPEED ENGINES AND THE OLDER TYPES OF LOW-SPEED ENGINES USED IN PIPE LINE SERVICE.

	High-Speed			Wt. per
Engine make—	B.h.p.	R.p.m.	Total wt.	B.h.p. (lbs.)
A	300	750	12,000	40
B	105	900	7,250	69
C*	50	900	2 675	53

	High-Speed			Wt. per
Engine make—	B.h.p.	R.p.m.	Total wt.	B.h.p. (lbs.)
D	300	200	108,000	360
E	140	164	76,000	543
F	60	225	25,000	417

*Represents a multiple-cylinder gas engine in com-

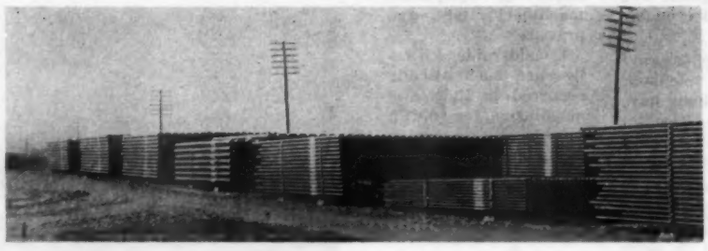
parison with a low-speed single-cylinder oil engine used in field gathering systems.

In special cases the electrical motor may continue to be used for driving pumping equipment in field gathering stations; but the most promising unit for fields in which a satisfactory crude oil for fuel is available is the high-speed, solid injection Diesel engine connected through a gear increaser to a multistage high-pressure centrifugal pump. A closed water cooling system with a heat exchanger will be used in such an installation.

It is becoming a common practice among pipe line companies to use floating roof tanks at the central receiving station in new fields to prevent the heavy losses of gasoline and other usable products through evaporation at the first station.

Were it not for the fact that there is a large amount of second-hand standard weight pipe available in the duplicated facilities of the pipe line companies a very light-weight pipe would be used for the gathering lines and the central receiving station. The future gathering system within a given field will probably be built of such pipe; but it is more economical to use for the present the second-hand pipe which is available. Considerable time will be required to consume the large amount of pipe which can be spared from duplicated systems in the older fields.

There is not only an unwarranted, but also uneconomical duplication of pipe line facilities in the declining fields of the Mid-Continent area. It has been rather difficult for the various companies to find a satisfactory solution of the problem and it appears that it will be solved largely by economic forces in course of time. Gradually large quantities of second-hand pipe and other pipe line equipment will be salvaged from such fields for use elsewhere.



Pipe racked after being cleaned, classified and inspected

Pumping Practices

Due to the fact that only a small quantity of pipe line pumping equipment has been purchased during the past three years for trunk line service and since only a few new installations have been made, not enough important changes have occurred in pumping practices to establish any different trend. In the case of the few new pumping installations which have been made in the past two or three years the solid injection engine has been purchased in preference to the air injection engines. Appreciably higher speeds and lower weights per brake horsepower are used in the design of these engines.

Operating experience indicated that corrosion in the fuel pump and injection nozzles results in leakage and consequently a loss of balance in the fuel charges to the cylinders, which in turn develops serious operating and maintenance problems. The parts of the injection system are subject to very active corrosion when crude oils with a high sulphur or hydrogen sulphide content are used.

As a rule an engine for pipe line service uses the same crude oil which is pumped by the unit rather than special fuel oils as recommended by the manufacturer. It appears that considerable research and development work must be done by the manufacturers to adapt the high-pressure solid injection system to the use of all grades of crude oil as fuel. It should be borne in mind that engines for pipe line service are installed sometimes in remote areas where it would be difficult and expensive to deliver special fuels and in certain areas only corrosive crude oils are produced.

The reciprocating pump is still used for large-capacity installations. Because of its lower efficiency and lack of flexibility in operation the centrifugal pump has not been able to replace the reciprocating unit.

For high-pressure pumping service, most pipe line engineers are inclined to the use of forged steel fluid cylinders rather than cast iron or cast steel cylinders, because it has been learned by experience that frequent failures occur in the castings in course of time whereas a failure in the forged steel cylinders of pipe line pumps is so uncommon that such cylinders are regarded as free from bursting failures.

The development of hard surfacing materials and heat treating processes has brought back into use the wing guided valve, which gave way to the use of the ball valve years ago. Some of the advantages of this type of valve are less weight, quieter operation, and low maintenance cost.

New pumps will probably have fewer valves than the older types, because operating men have found that operating troubles are more frequent and the maintenance expense is higher for pumps with the greater number of valves, and any appreciable reduction in the number of valves will result in operating economies.

The development of the light-weight high-speed Diesel engine to compete with the electrical motor drive has resulted in a compact engine-driven centrifugal pumping unit which will undoubtedly find extensive use for field gathering or relay stations. The high-speed engine is noisy; it has a higher maintenance cost, and is less dependable than the low-speed engine. On the other hand this type of unit has the advantage of less weight and greater portability, less expensive installation, and a low first cost, which more than offsets the difference in operating costs. To these advantages should be added the adaptability of the engine for driving a centrifugal pump through a gear increaser.

The fuel injection systems of the high-speed solid injection engine are more sensitive to the type of fuel used than the low-speed air injection engine and further the corrosion of the parts of the injection system of the solid injection engine results in serious operating problems when a corrosive crude oil is used as a fuel. The aluminum piston has not proved satisfactory in the high-speed engine burning crude oil containing hydrogen sulphide, the result, perhaps, of unbalanced fuel charges on account of corrosion in the injection system. Careful consideration should be given the matter of the fuel available for the operation of the engine before it is purchased. At the same time the manufacturers should not overlook the urgency of correcting these faults during the lull in the purchasing of such engines for pipe line service if they expect to realize the benefits of new buying when it becomes necessary again.

Although this type of unit might find its way into trunk line service to take care of peak or temporary loads, its principal use will be found in field gathering or temporary stations.

About six years ago the Gulf Pipe Line Company was confronted with the problem of using Diesel engines in a region where the water supply was small and poor in quality for cooling water. This problem was overcome by the installation of a heat exchanger in the crude oil suction lines to the discharge pumps to make use of the crude oil as a cooling medium for the engine jacket water which was circulated through a closed system in which the heat exchanger was also connected. This development has proved to be one of the most important contributions in the use of Diesel engines for oil pipe line pumping service. This use of the heat exchanger has made possible the use of the Diesel engine in regions and oil fields where the supply of water is very small and the quality of water is bad. It has reduced the operating and maintenance cost and minimized the number of shutdowns on account of cracked heads and other mechanical failures on account of excessive heats. The loss of water from the closed circulating system is small and consequently the small amount of water which must be added at various intervals can be supplied as rain or treated water, which will be free of scaling properties.

A number of such heat exchanger installations have been made during recent years. The earlier installations were made at new trunk line stations or when additions were made to existing stations. An important advantage of the heat exchanger in field gathering station installations is that it simplifies the cooling system, reduces the time to build a station, lowers the first cost of the field station and minimizes the loss in materials when the station is abandoned and dismantled. As a result of these advantages, the heat exchanger has come into use to replace the old type cooling systems for field gathering stations.

Heat Exchanger Practices

The customary practice has been to make use of a low-pressure exchanger in the crude oil suction lines. The crude oil passes through the heat exchanger tubes and the engine cooling water is circulated around the tube bundle. Such installations can be made on the suction lines if the pressure drop across the exchanger does not interfere with the proper filling of the pumps by the natural gravity head from the height of oil in the pipe line working tanks; otherwise, it is necessary to use a low-pressure booster pump in the suction line to overcome the friction loss across the exchanger to keep the pump filled. The limited pressure loss across the exchanger in this type of installation required a greater number of tubes to take care of the limiting friction loss and at the same time provide enough tube surface to take care of the low heat transfer due to the low velocity through the tubes.

New line being laid in old ditch

The Stanolind Pipe Line Company has deviated from this general practice by installing high-pressure heat exchangers in the discharge piping of the pumping unit, thereby eliminating the use of the low-pressure booster pumping unit on the suction line, simplifying the piping and operation. The first cost of the high-pressure installation is less than the low-pressure system with the additional advantage of eliminating the operating cost of the booster pumping unit. The high-pressure exchanger has proved just as satisfactory as the low-pressure.

The crude oil piping for some of the first high pressure installations was not entirely satisfactory because sufficient provision had not been made to take care of the forces of contraction and expansion. After some failures in stiff connections which could hardly be avoided, high-pressure "groove and gasket couplings" were tried, but without success. It is believed the problem has been solved by the

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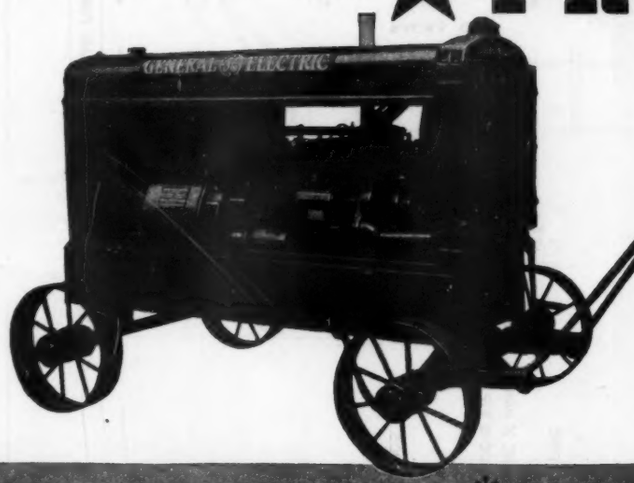

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The stable, flexible arc of the Type WD G-E welder helps to produce the superior physical characteristics of welds made with G-E Type W-22 or W-23 heavily coated electrodes. These high-quality welds reduce maintenance expense by eliminating joint leaks, and thereby add to profits.

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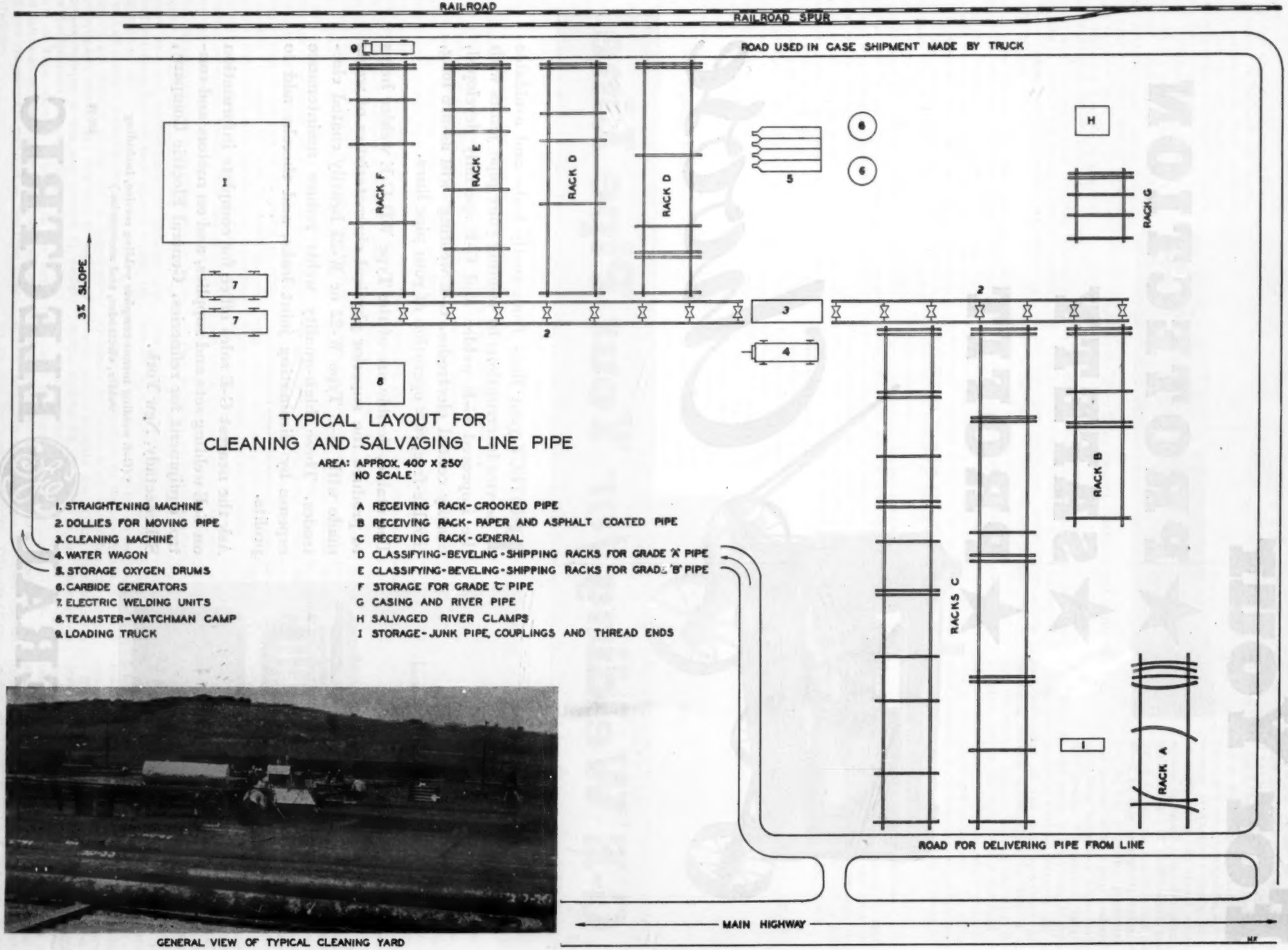


TYPICAL LAYOUT FOR CLEANING AND SALVAGING LINE PIPE

AREA: APPROX. 400' X 250'
NO SCALE

1. STRAIGHTENING MACHINE
2. DOLLIES FOR MOVING PIPE
3. CLEANING MACHINE
4. WATER WAGON
5. STORAGE OXYGEN DRUMS
6. CARBIDE GENERATORS
7. ELECTRIC WELDING UNITS
8. TEAMSTER-WATCHMAN CAMP
9. LOADING TRUCK

A RECEIVING RACK - CROOKED PIPE
B RECEIVING RACK - PAPER AND ASPHALT COATED PIPE
C RECEIVING RACK - GENERAL
D CLASSIFYING - BEVELING - SHIPPING RACKS FOR GRADE 'A' PIPE
E CLASSIFYING - BEVELING - SHIPPING RACKS FOR GRADE 'B' PIPE
F STORAGE FOR GRADE 'C' PIPE
G CASING AND RIVER PIPE
H SALVAGED RIVER CLAMPS
I STORAGE - JUNK PIPE, COUPLINGS AND THREAD ENDS

GENERAL VIEW OF TYPICAL CLEANING YARD

Successive Steps in Taking Up, Cleaning and Salvaging Line Pipe

(1) Ditch stripped ready for take up. (2) Taking pipe out of ditch. (3) Numbering joints to locate corrosive areas. (4) Loading pipe to be hauled to cleaning yard. (5) Unloading at cleaning yard into various racks. Note pipe being tallied as unloaded. (6) Straightening crooked pipe. (7) Pipe being run through cleaning machine. Note close inspection and classification. (8) Cleaned pipe racked. (9) Cutting off thread ends prior to final inspection. (10) Reclaimed pipe being loaded for shipment

"Shield-Arc"

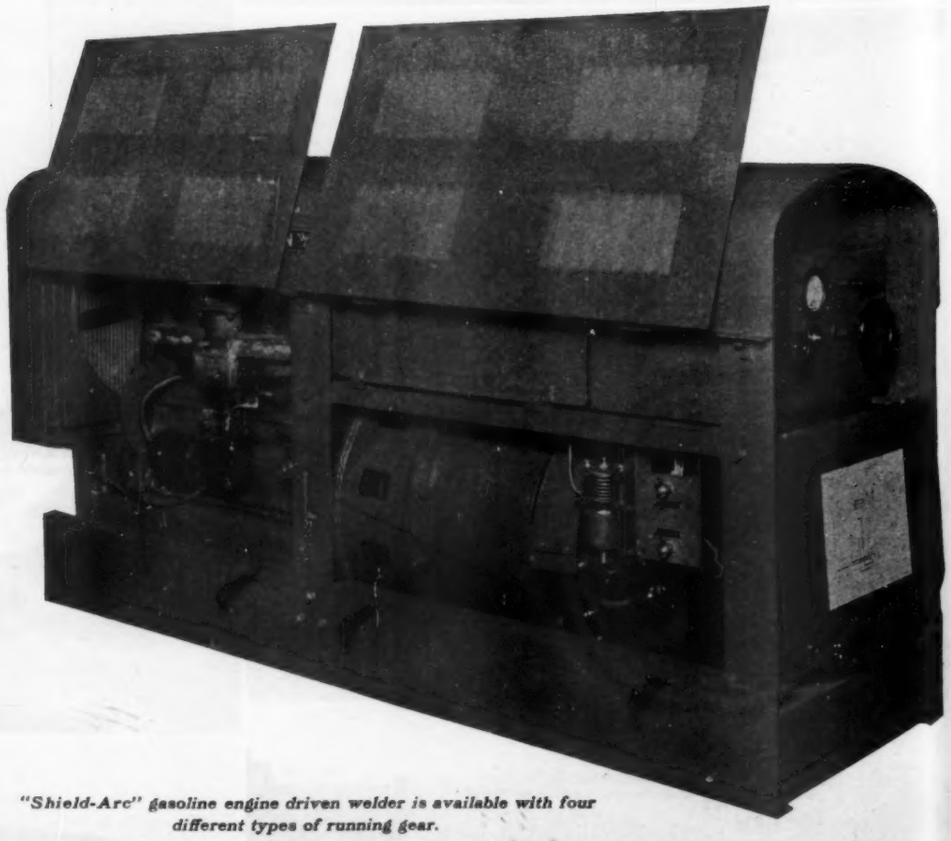
Butt Joints without Backing are welded by "Shield-Arc"

Simple clamp holds pipe in place for tack welding.

Tack welds hold pipe in alignment for roll welding.

"Shield-Arc" welded joints are smooth inside. No icicles inside pipe.

MORE miles of pipe lines were welded in 1933-34 by the shielded arc with Lincoln equipment than by any other process. This leadership can only be attained by the most reliable method of joining pipe. And records prove that lines welded with Lincoln equipment are universally satisfactory on all counts—performance, installation, maintenance and operating efficiency. What else could you expect when Lincoln's shielded arc produces pipe line welds stronger, more ductile, equal in density and more resistant to corrosion than the pipe itself.



"Shield-Arc" gasoline engine driven welder is available with four different types of running gear.

LINCOLN

leads in pipe line *Welding*

RECORDS come easy to Lincoln's shielded arc. More miles of pipe lines have been arc welded with Lincoln welders and Fleetweld Electrodes than all other arc welding equipment.

Its faster welding speed and economy of operation make it easy for the *"Shield-Arc"* welder to hold this record. For example, *"Shield-Arc's"* uniform current allows you to use a higher average current with less splattering and waste of molten electrode metal. Thus with a *"Shield-Arc"* more weld metal is deposited per unit of time.

"Lincontrol" is another exclusive *"Shield-Arc"* feature which increases weld production by putting control of welding current right in the operator's hands regardless of his distance from the machine. No trips back and forth to regulate welding current. The operator can devote full time to actual welding. "Lincontrol" requires no extra cables or portable accessories for operator to carry.

The *"Shield-Arc"* pipe line welder saves as high as 35% on fuel consumption, also saves oil and reduces engine wear, due to its exclusive idling device which automatically slows down the engine 30 seconds after arc is broken. The time delay allows change of electrodes without affecting welding current.

With the new high capacity *"Shield-Arcs"* you can use larger electrodes . . . and larger electrodes mean more weld in less time—more weld per dollar. No other pipe line welder can offer such savings.

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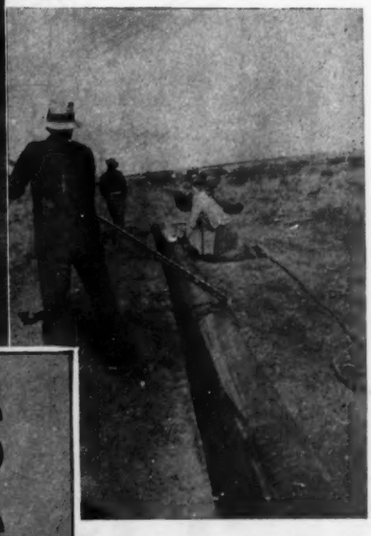

Welding with a "Shield-Arc" on the firing line of the longest gas line built last year.

SHIELD-ARC WELDERS ELECTRODES AND SUPPLIES

use of long radius vertical S-bends to connect the heat exchanger aboveground in the discharge line as shown diagramatically in Figures 1 and 1-A.

One of the first problems encountered in the use of the heat exchanger in closed systems for cooling the jacket water from Diesel engines was the corrosion of the heat exchanger tubes on the water side. In some cases electrolytic action between the metallic parts of the exchanger may result in corrosion, but generally the corrosion results from the presence of oxygen in the system or corrosive elements in the water. The closed system must be properly vented to reduce the oxygen in the system. Corrosion on account of the acid condition of the water can be greatly reduced by increasing the Ph value of the water by the addition of alkaline substances and small quantities of chromate salts.

A problem is encountered in adapting the heat exchanger in a closed system to certain types of engines having water-cooled pistons, which make use of telescopic tubes inside the crankcase. Experience shows that a small quantity of oil from the crankcase will find its way into the cooling water system, which results in the accumulation of a coating of oil on the heat exchanger tubes and consequently the lowering of the heat transfer to make the system inoperative. In such a case special provisions must be made to prevent oil from the crankcase getting into the system through the telescopic tubes. Each engine should be considered individually in the selection of the type of cooling system.

It is a policy of most pipe line companies to continue the practice of repairing corroded lines by electrical welding. Sleeves are being used over leaking couplings. Some companies are electrically welding the ends of the coupling to the pipe in case the leak is not too bad. Pits are being spot welded; patches, slabs, and half-soles are being welded to the line and in some instances very badly corroded pipe is being encased in sleeves which are split and welded together.

In the welding of couplings, the Stanolind Pipe Line Company has developed a pipe collar welding jig as shown in Figure 2 to take the strain off the threads and to prevent the pipe from pulling out of the coupling while it is being welded The original jig weighed about 280 pounds, but improvements are being worked out jointly by the representatives of the Oklahoma Pipe Line Company and the Stanolind Pipe Line Company to reduce the weight. It is the practice of some pipe line companies to provide their welders and connection foreman with pit gauges to enable the men to know within what limits spot welding of pits can be done safely. It is the practice of some companies to make such repairs as have been outlined rather than to replace the corroded pipe with good pipe and to apply a protective coating. The justification for such repairs rests largely on the lack of time to take a line out of service in a multiple system or to drain the lines and replace the pipe. In the case of a single line the patching has been justified on account of a loss of oil or damages in cutting the line.

Procedure in Corrosive Areas

Although these repairs will serve temporarily, continuous trouble can be expected in such corrosive areas. The cost of making a pipe replacement in corrosive areas is more economical in many cases than patching, slabbing, sleeving, or spot welding. There are conditions which warrant spot welding and some patching, but when the general condition of the pipe is bad the replacement of the pipe is more economical, especially since it will be necessary to return to the same place to make repairs as time goes on.

It is the practice of some companies to make these temporary repairs and return the pipe to the ground bare. This procedure does not seem logical. Once a corrosive area has been found, the course of the corrosion should be determined and steps taken to correct the condition. In most instances, the only remedy is the proper application of a coating. Failure to make as many permanent repairs as possible in corrosive areas only adds to the burden of the maintenance problem of the future, which can become so burdensome, especially for the longer systems, that the problem becomes almost uncontrollable. The writer is of the firm opinion that the patching of lines rather than replacing the pipe and coating in corrosive areas is not a good policy and should not become a general practice of the industry.

Since the attention of the field men has been directed to the many causes of corrosion they have become more observant and corrosive areas are being found by their practical knowledge. Electrical currents on the lines are being determined to show where the electrical energy is dissipated into the soil. Such places are found usually to be corrosive. Soil resistance measurements are being made also to locate corrosive spots. The various means for finding the hot spots are helpful, but they do not locate all of the corrosive areas.

Our knowledge of the corrosion problem today warrants the industry's program of reconditioning only those parts of the lines which are either known or believed to be bad. In general there is no justification for reconditioning the entire length of trunk lines. On the other hand it must be remembered that even though the percentage of bad pipe

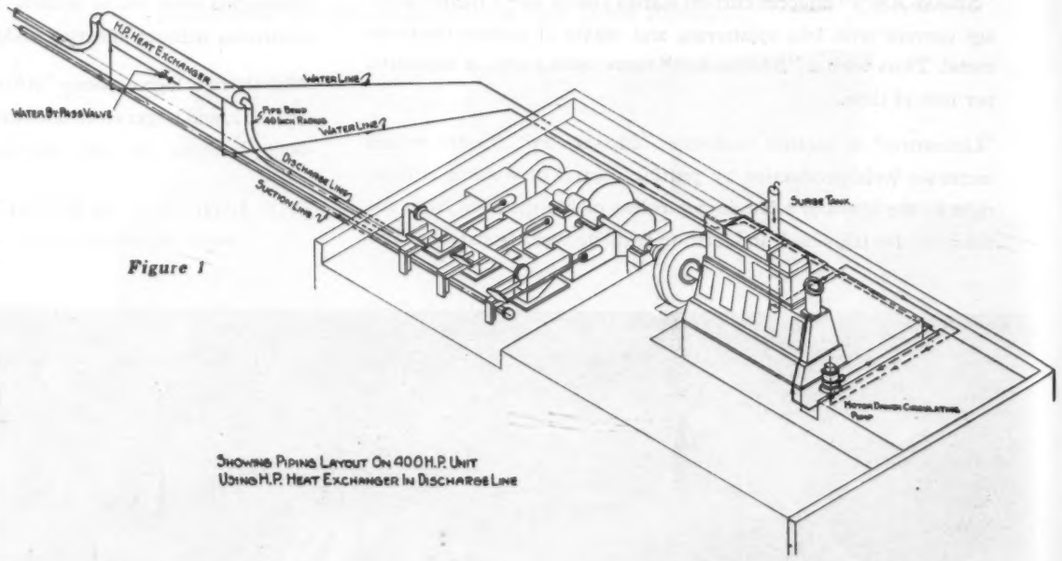

Figure 1

Showing Piping Layout On 400 H.P. Unit Using H.P. Heat Exchanger In Discharge Line

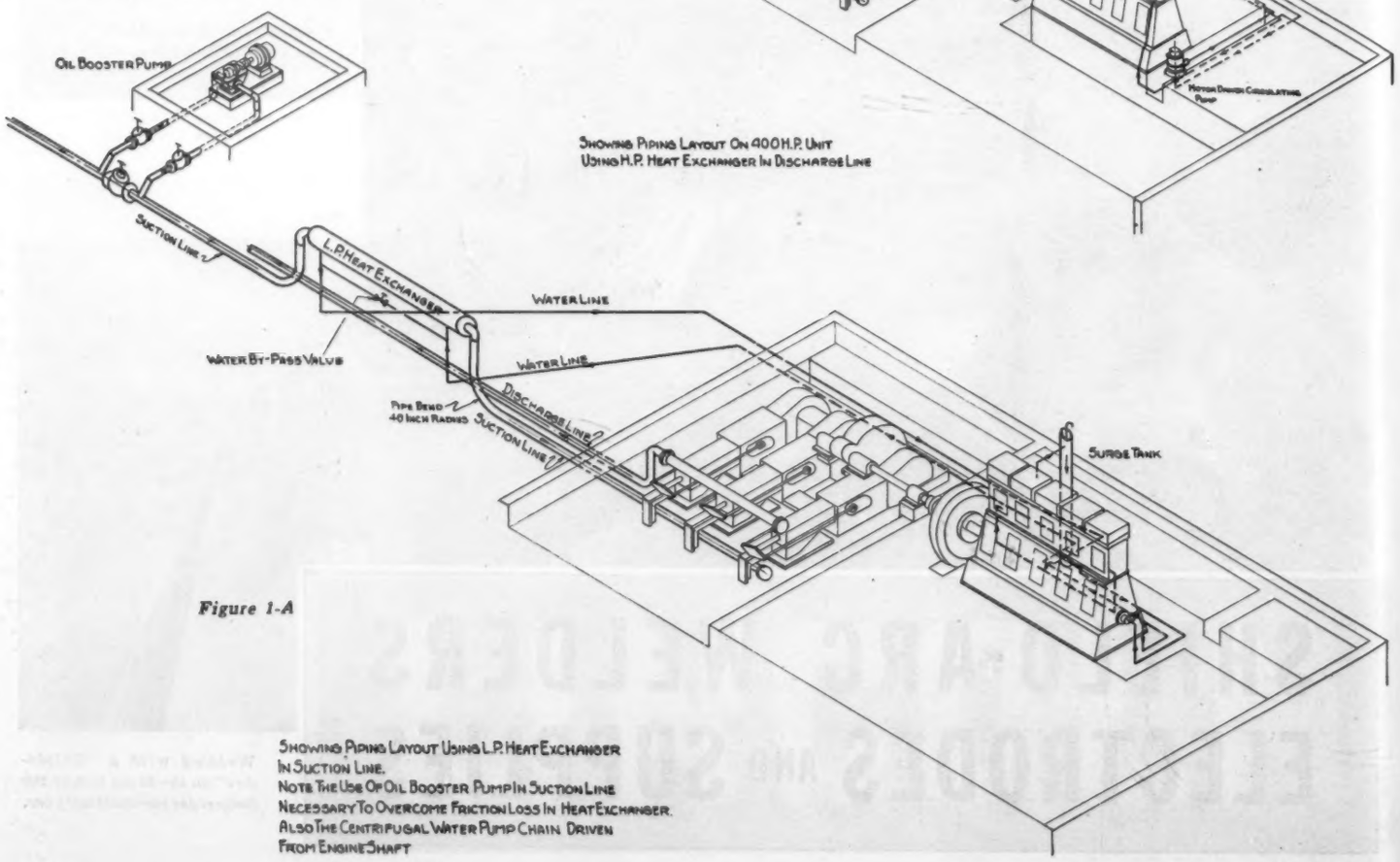

Figure 1-A

Showing Piping Layout Using L.P. Heat Exchanger In Suction Line.
Note The Use Of Oil Booster Pump In Suction Line Necessary To Overcome Friction Loss In Heat Exchanger.
Also The Centrifugal Water Pump Chain Driven From Engine Shaft

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is small, it is scattered over the entire length of the line, which necessitates the continuous use of maintenance crews on the older lines, and the same experience can be expected for even the newer lines which were laid bare.

The step taken by the Stanolind Pipe Line Company in the spring of this year to modernize a part of its trunk line system in Kansas and Oklahoma may be of some interest, since its plan indicated another procedure for combating the corrosion and obsolescence of some of the older lines. The multiple system of lines between two trunk line stations, A and B, consisted of 14 miles of one 6-inch screw line, three 8-inch screw and one 10-inch coated line from Station A to the junction and 26 miles of a single 6-inch and 8-inch screw line along with 26 miles of 12-inch and about 20 miles of a 12-inch loop between the junction and Station B. The 6 and 8-inch lines were screw, lapweld lines, varying from 14 to 17 years in age, and either bare or with a poor coating of asphalt which was applied when coatings first came into use. Careful consideration had been given to various plans for taking the 6 and 8-inch lines out of the ground, welding the couplings, cutting out bad pipe, reconditioning the lines, applying a protective coating, and putting back in the ground. The conclusion of these studies was that it would not be economical to recondition any of these lines. It was decided that not only on account of the lapweld and screw joint, but also on account of their diameter, the 6 and 8-inch lines were obsolete and at an opportune time when these sizes of pipe were needed in the gathering system or for warehouse stock, the 6 and 8-inch lines should be taken up and replaced by a modern welded and coated line of whatever size that would be required to give the same capacity, because an engineering investigation by the company showed that the new single welded coated 12-inch line could be laid complete and ready for service at a cost which would be less than the equivalent value of the amount of salvaged pipe required for the building of additional facilities in new gathering systems and for lateral or tributary extensions from the trunk lines to new fields.

Economics of Plan Are Sound

Conservative estimates were made for the loss of threads, couplings, and bad pipe and reasonable values were provided for the pipe which could be salvaged and used. The work was undertaken on the basis of this economic set-up and although the cost figures are not complete the information available now indicates that the cost will conform with the estimates and that the economics of the plan were sound. The advantage of the plan was the replacing of approximately 68 miles of 6 and 8-inch lines, which were obsolete for trunk line service on account of the thread and coupling joint and also on account of the small diameter by approximately 14 miles of single 12-inch line. The maintenance of the old line was eliminated and the mileage between stations was reduced by approximately 54 miles.

This plan called for the taking up of 145.73 miles of 8-inch and 182.70 miles of 6-inch or a total of 328.43 miles of both sizes and the laying of 70.48 miles of 12-inch pipe. The 8-inch pipe was used immediately for the construction of some welded tributary lines in western Kansas. Some of the 6-inch pipe was laid in new lines. A year's supply of 6-inch was put in warehouse stock, and some of the 6-inch was left in the ground until needed.

Although it would have been preferable to make these changes in a season when the trunk line deliveries were off-peak rather than at the beginning of gasoline consumption in the spring, the 8-inch pipe was needed for the construction of new lines and consequently careful planning was necessary to avoid the robbing of the trunk line system of needed capacity while these changes were being made. The planning was somewhat complicated by the fact that two kinds of crude were being pumped through the system and one of these crudes could not be contaminated by the other even to a slight degree.

It was decided to take up first one of the 8-inch lines from Station A to the junction, a distance of about 14 miles, and lay the new 12-inch line in the ditch of this 8-inch line. After the 12-inch line was tied in for service, the other 8 and 6-inch lines from the station to the junction were taken up. A single 8-inch line between Stations A and B was not involved in the plan since it was decided to keep this line for pumping a different grade of crude oil. The 26 miles of 6-inch line from the junction to Station B was not taken up for the time being, but was included in the plan as a future supply of 6-inch pipe.

At the same time the 8-inch pipe was being taken up by crews along the trunk line other crews were laying the pipe in western Kansas, which required careful planning and co-ordination of the various operations in reclaiming the pipe from the trunk line so that the three construction crews could be kept supplied with pipe.

Reclaiming the Pipe

First, the oil was displaced in the respective lines as they were taken out of service preparatory to dismantling them; then the line was tapped in the low points to permit the drainage of the water. These older lines were ditched to take the slack after they were laid and consequently the contractors decided to open the trench by hand rather than by machine. Another reason for not excavating by machine was that the trench was to be opened only to the top of the couplings. The various operations which will be described hereafter are shown on the picture layout on page 41.

Careful thought had been given to the procedure which must be followed in taking up, cleaning, classifying, reclaiming, and beveling the pipe so that it could be taken up and handled through the various operations sufficiently fast to keep the construction crews supplied with pipe and at the same time keep the costs within due limits. It was decided that we could not follow the customary practice of raising the line out of the ditch, placing it on skids and cutting out the couplings. This procedure was considered too slow and too expensive.

Since it was learned by experience that good bevels could not be made in the field by the beveling machine when the couplings were cut out with the line over the ditch it was decided also that there would be no advantage in raising the line out of the ditch. It was agreed that the plan should call for the stripping of the line so that the couplings were exposed on the top to permit the welder to cut the coupling across its face which would permit the tractor to spring the joint out of the coupling with a light pull with the boom winch hooked to the opposite end. The tractor lifted the joint out of and laid it along the side of the ditch.

By previous experience in taking up about 40 miles of 8-inch pipe the company had learned that it was not only a slow, painstaking and expensive job to clean, cut, bevel, straighten, and classify the pipe on skids over the ditch, but that such procedure did not permit of the proper supervision and co-ordination of the work. The work and the men were scattered over 5 or 6 miles along the right of way.

With its past experience as a guide, the company directed its attention to the necessity of transporting the pipe from the line just as it was taken out of the ditch to a centrally and strategically located piece of land bordering on a railroad spur or all-weather highway, where the pipe could be moved without delay through the various operations and an efficient and systematic method of doing the work could be carried out.

In addition to the proposed reconditioning and classification yards being strategically located with respect to the pipe line as well as the railroad spur or highway another requirement was that these tracts of lands should have a slight slope so that the pipe would roll by gravity from the receiving rack until it was ready to be loaded from the shipping rack to trucks or railroad cars. Suitable pieces of land, about 200 feet by 300 feet were chosen in advance of taking up the line so that the yard could be laid out for the various pipe racks and operations as shown in layout on page 41 which is typical of the routing of the pipe through the yard and the various operations performed.

The first pipe received at the pipe yards was used for building the various racks as shown. The racks consisted of pieces of 6 or 8-inch pipe spaced equally at distances along the ground as cross-members with two rows of 8-inch pipe laid and tack welded together as stringers along the length of the rack and spaced to permit the rolling of single length joints of pipe. Some of the receiving racks were loaded too heavily and on account of the small bearing area of the stringers on the cross-members some of the 8-inch pipe used as cross-members in the first racks was damaged by the wall surface being caved at the bearing point with the stringer. This condition was corrected in the later racks by splitting an 8-inch coupling and placing it between the cross-member and the stringer to give greater bearing area. In this manner the first pipe was used to assemble racks for:

(a) Crooked pipe to be straightened.
(b) Pipe with a coating of asbestos felt paper and asphalt which was burned off.
(c) Receiving pipe from the field.
(d) Classifying, beveling and shipping A grade pipe.
(e) Classifying, beveling, repairing and shipping B grade pipe.
(f) Storage for C grade pipe.
(g) Casing and river pipe.
(h) Salvaged river clamps.
(i) Storage for junked pipe, couplings and thread ends.

Location of Equipment

Such equipment as the straightening machine, stationary W.K.M. cleaning machines, electrical welding generators, carbide generators, loading winch truck, etc., was located with respect to its proper function in the operations.

The roads through the yard should be laid out so that trucks can move through the yard safely

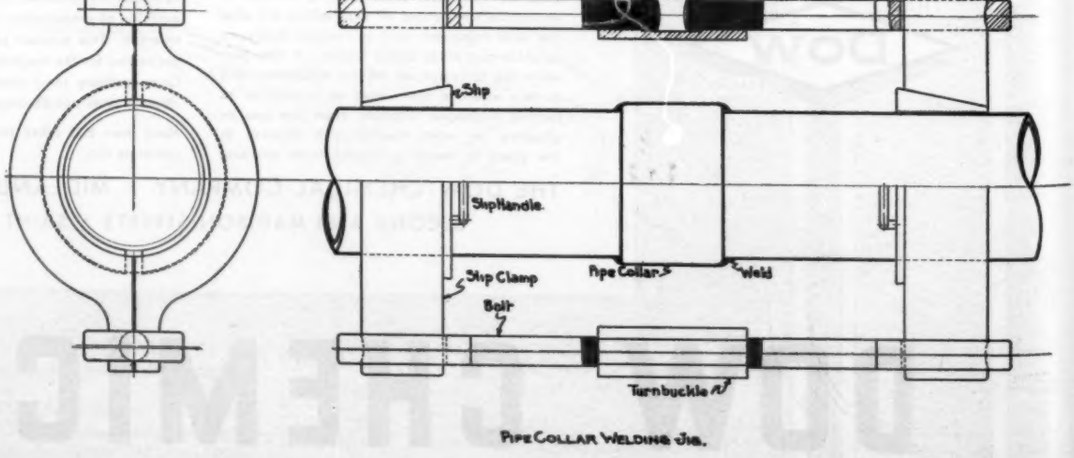


Figure 2

and without any interference among themselves or with other operations.

In order to encourage safety and good order, as well as fast and efficient operation, provision was made for the storage of the large quantity of junk in the form of split couplings, thread ends and short ends of pipe cut off laminated pipe. There was a place assigned also for the storage of river clamps which came off the old line.

Composition of Crew

An organization of about 20 men constituted a crew which carried out all of the operations on the pipe from the time it was received in the yard until it was loaded on the cars or trucks for shipment or put on the rack for storage or reclassification. Such a crew was composed of:

1. Foreman.
2. Pipe checker.
3. Material supervisor.
4. Cleaning machine operator.
5. Pipe inspector and classifier.
6. Corrosion observer.
7. Two welders.
8. Two welders' helpers.
9. One truck winch operator for loading pipe.
10. Eight to ten laborers for rolling pipe on racks, removing the split couplings from the pipe when received, straightening crooked pipe, policing yard and assisting in loading pipe.

After the single joints of pipe were removed from the ditch they were laid along the right of way for the inspection of an engineer who observed the general condition of the pipe, painted some code numbers on each joint to identify the nature of the soil as well as the location of the joint in the line, and recorded this information for a future record as to corrosive conditions along the right of way. This same information was used also in determining where a double coating should be given the new line which was laid back in the same ditch. When the pipe was thoroughly cleaned in the yard the code numbers were repainted on each joint and the corrosion observer inspected the pipe again and made a record of his observations.

The loose pipe along the right of way was usually loaded by a tractor with a side boom on trucks which transported it 6 or 8 miles to the pipe yard. Usually the split coupling was on one end of each joint of pipe and it was taken along to the yard where it was removed at the first receiving rack. All crooked pipe was unloaded on a rack built especially for it. The crooked pipe was straightened each day or two and moved through the yard with the other pipe. Casing and river pipe was put on a separate rack.

The pipe rolled by its own gravity from the receiving rack to the dollies which were built in line with the center of the stationary cleaning machine which permitted one man to move each joint of pipe over the dollies and feed it into the cleaning machine. A small stream of water was kept flowing over the cutters to keep down the dust from the bare pipe and to prevent the gumming of the cutters by the asphalt from the coated pipe.

No great trouble was experienced in cleaning the asphalt from the pipe, because the coating had not been applied well and the weather was still cool. It would have been almost impossible to clean the asphalt from the pipe during the hot summer months.

After the pipe passed through the cleaning machine it was carefully inspected and classified either as A, B or C grade pipe. An A grade joint was considered as good as new and was given a single white paint stripe around one end. A separate rack was reserved for each class of pipe as shown in the plan for the yard.

The B grade pipe was good serviceable pipe, but as a rule had a coating of rust on it. Joints of pipe with a few isolated pits in it were put on the B grade rack for spot welding. The B grade pipe was identified by two white stripes on one end of each joint. The A and B grades were kept separate in the shipments so that they would not get mixed in the new line which might slow down the cleaning and coating operation of the contractor.

The C grade pipe was unusable for oil lines and was stored separately. Its identification mark was three white stripes on the end of each joint.

In addition to these three classes of pipe it was found necessary to set aside some pipe which had a heavy coat of scale which could not be removed by the cleaning machine. This pipe came from parts of the lines, which had been laid about 16 years ago without a coating. It was not advisable to use it in a new coated line, but it was believed that if it were allowed to weather for about six months it would free itself of scale. This has occurred. The pipe is good usable material now, although it has a slightly thinner wall.

After the pipe had been properly classified the thread ends were cut off and the joint was beveled in the same operation with the oxyacetylene cutting and beveling machine.

Six to ten thousand feet of pipe per day can be moved through each of these yards, performing all of the operations which have been outlined. The pipe can be taken up in the field and moved to the yard at the same rate.

Pup joints were beveled and welded into longer joints for use in the new line. Joints of pipe with only a few pits were salvaged by spot welding.

A final inspection of the pipe was made by the material supervisor after it had been beveled and before it had been loaded out in 20-foot lengths for shipment on trucks or railroad cars.

An accurate record was kept on all pipe from the time it moved from the pipe line right of way until it was properly disposed of as a shipment for storage or to junk.

Temporary field pipe racks of reclaimed pipe adjacent to railroad spur. Note markings and straps to avoid theft and facilitate a quick inventory and inspection

Some laminated pipe was encountered when the cutting and beveling operation was done. Much of this pipe was purchased during the war period, which accounts for the lamination. Laminated pipe will take a thread, but the defect shows up under the oxyacetylene torch. About 1,500 feet of pipe was lost as junk on account of short laminated ends being cut off. An oxyacetylene weld cannot be made satisfactorily on laminated pipe and since this type of welding was being used on the construction of the new line, it was necessary to cut off the laminated ends of the pipe. It has been learned since, however, that laminated pipe can be welded satisfactorily by electrical butt joint welding.

The pipe which was not used immediately for the construction of new lines was stored in the reconditioning yards adjacent to railroad spurs, so that it could be shipped conveniently when needed. This pipe was put on the racks without cleaning or beveling, because it was felt that the cleaning process would subject the metal of the pipe to the elements which would result in an active corrosion; whereas the soil, rust, scale, or asphalt in case of the coated lines left on the pipe would provide a protection against atmospheric corrosion. In addition to this advantage the pipe would be easier to clean after it had been exposed to the elements.

Special care was given to the racking of the pipe. Each joint was accurately measured, a tally made. The total footage of pipe in each tier, as well as the amount of pipe in the racks, was shown on the face of each tier. The tiers of pipe were nearly plumb and level and the pipe in the tiers was kept in line on one end. The tiers were spaced apart equally by 1 by 4-inch lumber and the pipe was prevented from rolling by the use of uniform blocks nailed to each end of the spacers. This procedure permitted one to make an easy and quick inspection of the rack to detect any theft and at the same time provided a quick inventory.

In order to prevent any accidents to children playing around these pipe racks and to discourage theft one and one-half by one-quarter inch flat bars were used to bind the tiers of pipe in position as shown in the accompanying photograph. As a further discouragement to theft the faced ends of the top tier of pipe were tack welded together. There is evidence of theft already having been discouraged by this procedure.

Cost of Operation

The cost of taking the pipe out of the ground, transporting it, straightening, cleaning, classifying, reconditioning, beveling, and either loading or putting on the racks for storage amounted to about 15 cents per foot for 8-inch pipe and 1 cent or 2 less for the 6-inch pipe. This figure does not include the damage costs for taking up the lines and possibly some overhead of the general office expense.

The second-hand pipe which was laid in the new lines, as well as the new 12-inch pipe was welded either by the oxyacetylene or the electrical method. The second-hand pipe was cleaned a second time with a traveling type W.K.M. cleaning machine after the pipe had been welded in the line. Likewise, the new 12-inch pipe was cleaned after it had been welded in the line. All of the new line was coated with the regular Stanolind coating consisting of a primer and hot parolite coating with a spiral wrapping of asbestos felt paper bonded to the inner coating of hot asphalt and water-proofed on the outside with another coating of hot asphalt.

No electrical welding was done on the second-hand pipe, but some of the new 12-inch pipe was electrically welded, using the butt joint, and it has proved thoroughly satisfactory. In addition to the usual construction equipment, the Gardiner coating machine, the W.K.M. new type cleaning machine and the Johns-Manville spiral wrapping machine were used in this work. As much as 10,000 feet of 8-inch and 10-inch line also was laid and coated in a 10-hour working day. The new lines were tested with air and a chemical colodorant was used to find any small leaks which might develop under the 100-pound air test which was left on the line for 24 hours.

Bridge Built for Line

One of the new 12-inch loops laid by the Stanolind Pipe Line Company, in its program for modernizing the trunk line, is provided with a pipe line bridge crossing at Hominy Creek. The bridge was built because the water in this creek is salty and very corrosive and further the creek banks are subject to sliding.

At the same time new crossings were provided on the same bridge for the older lines in the creek, which were badly corroded and were to be renewed. The bridge is an economical crossing for the average creek when one considers the frequent replacements of pipe in creeks. The pipe line bridge will come into gradual use as the replacement of lines in creeks and the smaller rivers becomes necessary.

A brief statement should be made about the progress in welding. The development of a fast rod and the multiflame welding torch has speeded up, reduced the cost in labor and materials, improved the weld, and facilitated the making of an oxyacetylene weld. At the same time the oxyacetylene automatic cutting and beveling torch has been improved to eliminate the wear in the parts and to give better cutting alignment so that true and good bevels can be made by this machine, which is be

ing used extensively for cutting and beveling second-hand threaded pipe for welding.

Electrical welding generators have become a necessary part of the equipment of each maintenance crew on account of the fact that only this type of welding is adapted to the repair of lines filled with oil, and consequently the extension of its use to the welding of butt joints can be expected. Electrical welding is being used in the industry for the fabrication of piping systems, because it does not warp or throw out of alignment the flanges or fittings which are a part of the piping system. The improvements in electrical welding, especially the development of a successful butt joint has made it possible for pipe line companies to salvage large quantities of pipe which was junked because it was not economical to cut out and weld together shorter sections of the pipe into longer ones.

Important developments in electrical welding have been the adapting of this type of welding for the making of butt joint and bell hole welds, coated rods to give ductile welds, the increasing of the voltage across the arc from 25 to 40 volts, a large reduction in the weight of the welding generating units which has made them more portable, and the elimination of the resistance reactor.

In the making of "firing line" or roll welds in the construction of new lines three beads are made as shown in the following table. Five beads are used for making bell hole welds.

	Size of rod	Amperage	Voltage
Stringer bead .	1/16"	150-200	25-40
Second bead ...	1/8"	200-250	40
Third bead	5/32"	250-325	40

The weight of the 300-ampere welding generating unit has been reduced in weight from 3,000 to 2,165 pounds, or nearly 28 per cent, and the 200-ampere generating unit has been reduced in weight from 2,200 to 1,670 pounds, or about 24 per cent.

The oil pipe line industry has never had a satisfactory method for taking care of drainage oil when it was necessary to cut or replace pipe in a large single line. The customary practice has been in such cases to excavate a pit to receive the oil or impound it with a dam in a creek or ravine. For small amounts of oil drainage, such a practice does not result in too serious a loss; but when the oil drainage is greater than a few hundred barrels, the expense of digging and backfilling the pit and transferring the oil, along with the loss of a greater part of the oil and the damages become a large item. In addition to the expense there is a serious fire hazard with oil stored in open pits. If the oil is impounded in creeks or ravines, there is always the risk of the oil being carried away by the water drainage, which would result in serious damage. Quite often it is found necessary to replace pipe in single lines which are near communities, industrial sites, railroad bridges, lakes, or in the drainage area of city water supplies, where it is not advisable to permit any amount of crude oil to be stored in open pits. Such conditions are encountered and in addition there may be 2,000 or 3,000 barrels of drainage in the case of the larger lines. For the lack of means for taking care of the drainage to make the replacement of the pipe the corroded pipe has been patched, half-soled, or sleeved entirely. This type of repair only postpones the day when the pipe must be replaced.

A recent experience of the Stanolind Pipe Line Company is typical of the conditions which have been outlined. About two months ago a leak developed in its single 10-inch line under the concrete highway between Jacksboro and Mineral Wells, Tex., about one-half mile north of Mineral Wells. The line was laid before the concrete highway was built and consequently it did not have a casing under the highway. The result was a corrosion leak in the pipe under the road. The road crossing was tunneled until the leak was found. It was repaired temporarily with a leak clamp and later a patch was welded over the leak so that the line could be put back into operation safely. A careful inspection of the line across the road, in the road ditches, and in a nearby creek showed it to be badly corroded and requiring replacement. The 10-inch line passed through a pecan orchard on one side of the road and the city park on the other side. The creek flowed into the city lake nearby. The city of Min-

(Continued on Page 102)

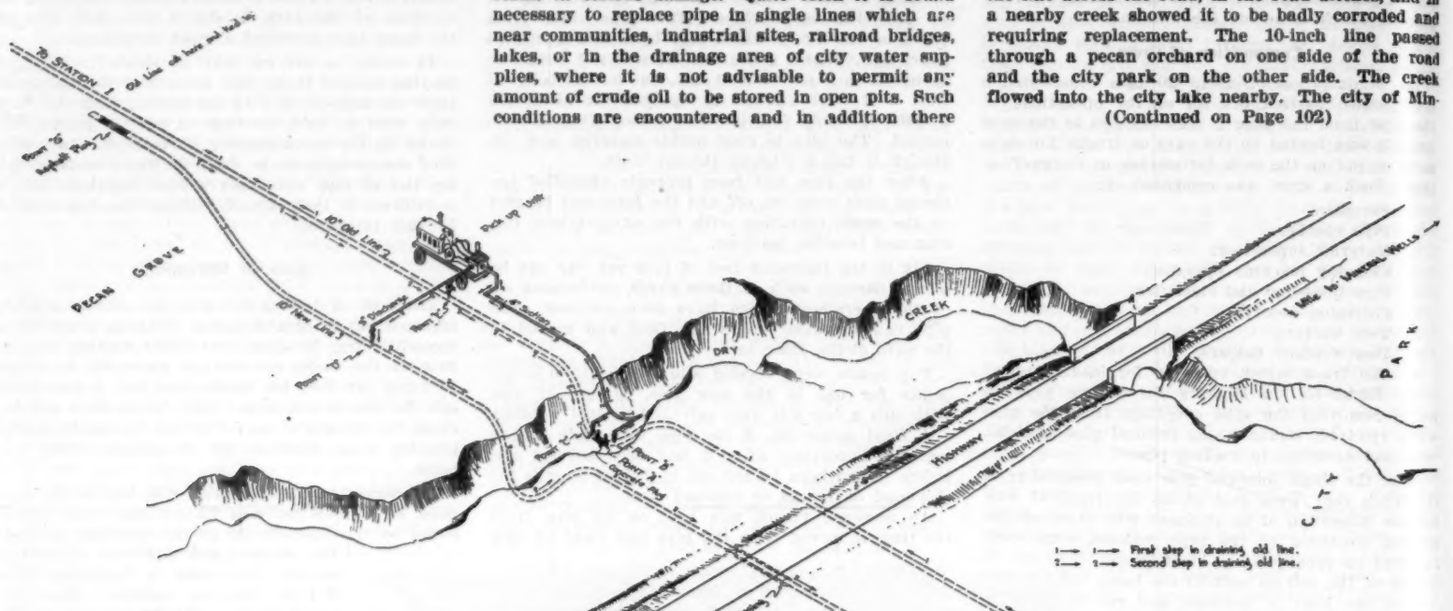
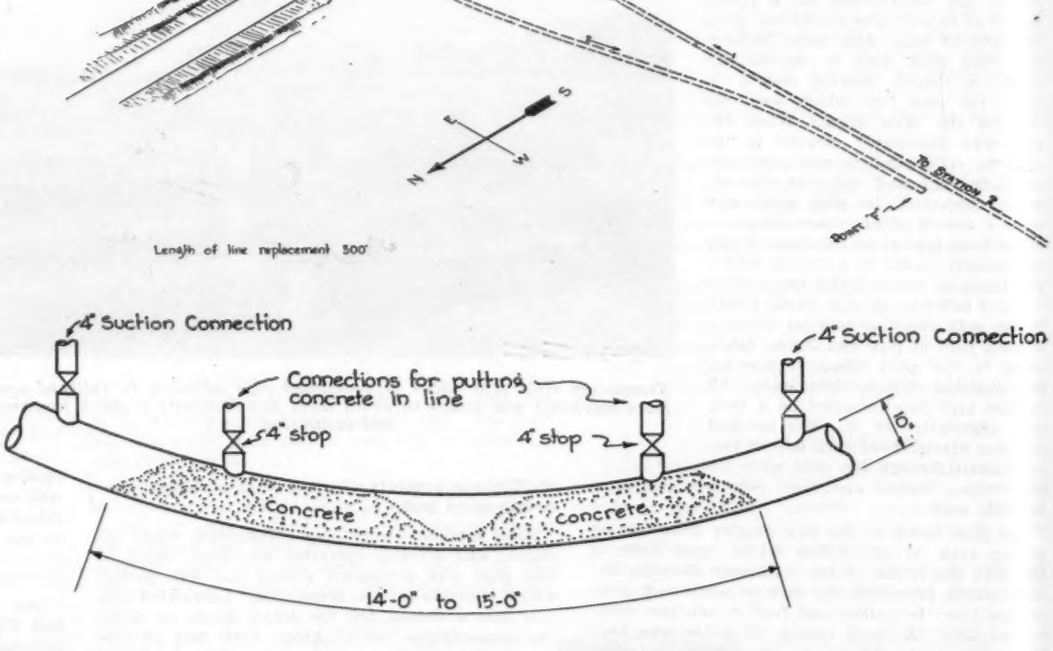
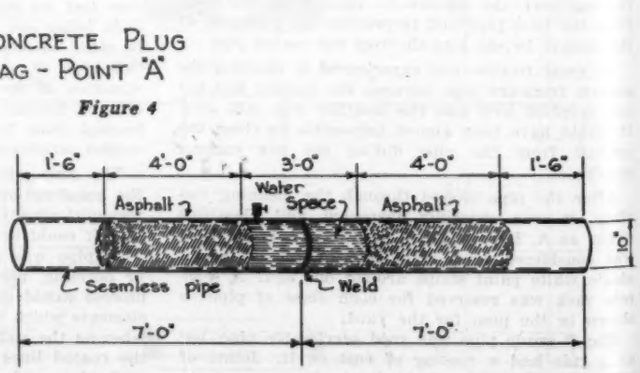


Figure 3



DETAIL OF CONCRETE PLUG IN CREEK SAG - POINT "A"

Figure 4

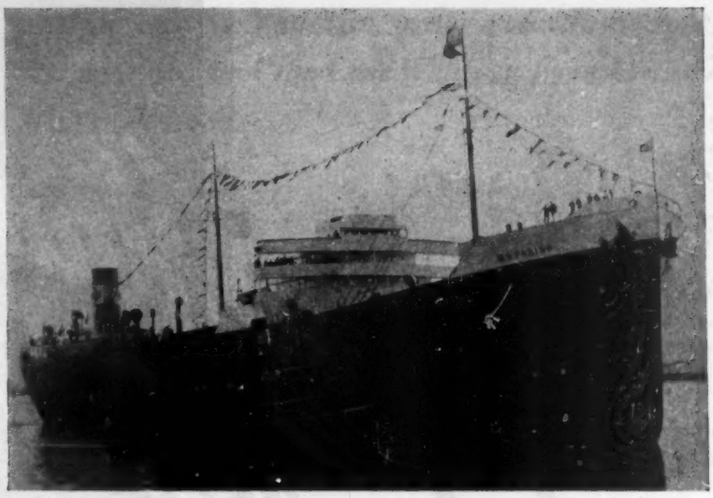


DETAIL OF ASPHALT PLUG

Figure 5

How Handling Oil at Gulf Coast Terminals Has Been Developed

Contributed by Representatives of Humble Companies



One of the largest tankers afloat

The construction of the first small loading terminal at Sabine Pass in the early part of this century to handle crude oil from the flush Spindletop Field marked the beginning of maritime development which today reaches great proportions in the handling of petroleum and its products in the Gulf Coast area.

A history of this development traces the handling of oil from the days of loading in wooden barges and whalebacks holding from 5,000 to 6,000 bbls. of cargo, with a terminal loading rate of only a few hundred barrels per hour, to the present-day development of over 70 berths in the Gulf Coast area accommodating vessels of 150,000 bbls. capacity with a loading rate of as high as 30,000 bbls. per hour. That part of the greater Gulf Coast area handling petroleum and its products extends from New Orleans, La., to Corpus Christi, Tex., with mileage along the water route and including the numerous inland canals and waterways of upward of 600 miles. The area is divided into four main districts, conforming to the custom districts, and known as the Mississippi River, Sabine district, Galveston district, embracing Texas City and Houston, and the San Antonio district including Corpus Christi and Aransas Pass.

In each of these districts are many loading and unloading terminals which have been constructed to take care of the handling of crude oil and refined products produced and refined in the Mid-Continent and Gulf Coast areas.

To show the magnitude of the present-day development of these facilities in the district along the Texas Coast alone, the total cargo loadings for the year ending December 31, 1933, of all commodities, was in round numbers 50,000,000 tons, of which petroleum and its refined products comprised 45,000,000 tons, representing 90 per cent of the total export and coastwise shipping.

By further comparison in terms of U. S. barrels handled over the docks in this area, the above tonnage of petroleum and its products represents 350,000,000 bbls., or over one-third of the total production of the United States for the year 1933 and approximately 20 per cent of the world production for the same period.

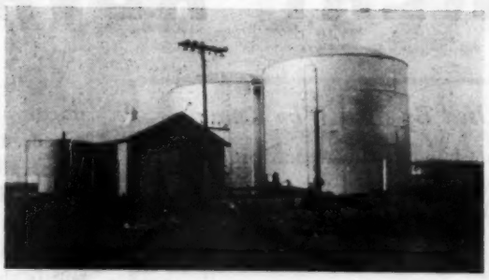
From the first Sabine loading terminals having loading rates of only a few hundred barrels per hour, the Gulf Coast terminals have multiplied to a present potential loading rate for crude oil of 338,000 bbls. and for refined oils of 232,000 bbls., or a total hourly potential loading rate of 570,000 bbls., this figure exclusive of package shipments loading across many docks.

The total daily loading rate represents a figure equal to six times the present daily allowable production for the entire United States. This enormous loading capacity is maintained in order to promptly dispatch tankers loading in this area.

The selection of sites for oil loading terminals is dependent on several important factors, among which would be, water of sufficient depth for handling tankers, proximity to oil producing areas, suitable sites for refineries and their relative location to established marketing centers, and, in the case of inland waterways, navigability of the stream to reach open water.

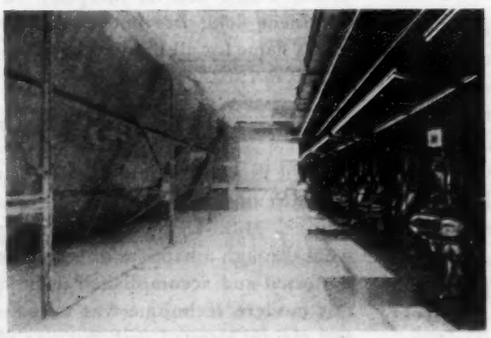
The selection of original terminal sites in the Sabine district were based chiefly upon two of the factors mentioned above; that is, close proximity to the flush Spindletop Field and subsequently developed fields in the Gulf Coast area, and accessibility to two well established and navigable waterways, the Neches and Sabine Rivers, both emptying into Sabine Lake and thence into the Gulf.

As the fields developed throughout the Gulf Coast area and with development extending into the Mid-Continent, more refineries were established and correspondingly more terminals were constructed to take care of the increasing business. As a result, the expansion of terminal facilities towards the east was in the direction of New Orleans and towards the west in the direction of Galveston and Texas City, and later, with the development of the Houston ship channel to the city of Houston. Then with the discovery still later of fields in Southwest Texas and West Texas and New Mexico, logical terminal sites were selected in the Corpus Christi district.



Typical Fire Foam plant at an oil terminal

Thus it is seen in reviewing the growth of oil terminals in the Gulf Coast area that the discovery and development of producing oil fields in the Gulf Coast area and Mid-Continent has had a most definite influence on the selection of sites for terminals in their natural order.



Inside pump room. Loading rate 30,000 bbls. per hour

With the present-day development of Gulf Coast waterways and ports, the selection of desirable sites, taking into consideration all factors above noted, are not nearly so difficult as they were 25 years ago. However, due to natural growth of various industries throughout this area, certain other factors are of vital importance today, such as initial cost of desirable terminal sites, proximity to established producing areas close to already established pipe line and railway systems which obviously must be taken into consideration when considering transportation costs from producing areas to seaboard.

Design of Docks

The design and construction of docks for oil loading and unloading terminals is of various types and sizes to fit the needs and conditions imposed on them. The types of docks found throughout the Gulf Coast area vary from the simplest skeleton type structure, which is hardly more than a mooring cluster with walkways and hose connection for berthing small ships and barges, to the long concrete docks principally found adjacent to refineries, capable of berthing several large tank ships.

The design of the dock for an oil terminal obviously depends on its location, whether in close proximity to the Gulf of Mexico and subject to greater stresses due to storms and tides or on the inland waterways and canals where the stresses due to the elements are less severe. The greater majority of dock structures are creosoted timber construction and the docks of more recent years usually have some sort of fender protection in front of the main structure. The purpose of the fender system is to absorb the shock of the ship when berthing which would otherwise be imposed on the main structure and which before the advent of the fender system proved to be a cause of very high maintenance on docks.

There are several types of fender protection used. Only two typical ones, however, will be briefly described in this article. The first type is a row of fender piling driven opposite the bents of the main structure approximately 7 to 8 feet in front with a penetration equaling the piling of the main structure. To these fender piling are fastened by waling strips both front and back two batter piling extending underneath the main structure, the principle of operation being that the main fender piling driven to the depth they are and aided by the two batter piling per bent have enough resiliency to come back to normal position after the impact of a ship. The batter piling play an important part in counteracting the shock and preventing damage to the main structure.

Second—another and slightly more recent type of fender piling is a system employing coil springs. This type is similar in design and purpose to the one above noted, but has as an added feature a system of coil springs to permit a movement of the batter piling independently of the vertical members of the fender system, thus allowing a movement of about 6 feet in front of the dock.

Pictures of the two types of fender systems described herein accompany this article.

Fender Systems

The necessity for the designs for fender systems at the majority of the docks arose out of the fact that certain difficulties were encountered in berthing the larger tankers due mainly to adverse wind and tide conditions. These conditions naturally cause frequent collisions between docks and vessels and to overcome the consequent high maintenance, fender systems were installed where these adverse element conditions existed. In the past few years, the oil industry has made great strides in overcoming water pollution. Ten years ago it was a common sight to see the waters and beaches adjacent to oil docks covered with oil but today these waters and beaches are clean and show no traces of oil. This change has been brought about by state and federal legislation and the wholehearted co-operation of the oil industry and no doubt has meant a financial gain to the industry through the saving and reclaiming of the oil that was formerly lost. Docks of the skeleton type and of creosoted timber construction being the cheapest and most practical for the loading of crude and liquid petroleum products, made it necessary to furnish this fender protection so that the main part of the dock or apron could be kept tight to prevent leakage of oil. If this part of the dock had to absorb the shock of the vessels when warping into berth, this would be impossible. The apron is constructed of tongue and groove decking, tightly caulked to prevent leakage of such oil as may be spilled thereon in the normal operation of the docks and the handling of the hose lines. This deck-

ANOTHER GREAT ADVANCE IN

OVER 500 miles of pipe line has been Lindewelded with the new Multi-Flame Lindewelding Head since the first of the year—and every mile is operating successfully today.

What It Is—And Does

Essentially, Multi-Flame Lindewelding involves three factors—the Multi-Flame Lindewelding Head; a special flame adjustment (employing a backhand technique exclusively); and a special welding rod. The Multi-Flame Lindewelding Head consists of a special chromium plated tip that has three flames: the main welding flame, and two auxiliary smaller flames located about 1¼ - in. from the end of the tip. These two smaller flames preheat both edges of the vee ahead of the point of welding. An excess acetylene flame carburizes the base metal surfaces just ahead of the advancing puddle. The special welding rod perfected for Multi-Flame Lindewelding insures the highest physical properties in the weld metal. The combination of these three factors has resulted in greater speed and economy in the production of pipe welds over previous methods.

Used By Men Who Know

Over one hundred experienced pipe line operators have already used the new Multi-Flame Lindewelding Head on hundreds of miles of pipe line. The strongest proof of their unqualified acceptance is found conclusively in the fact that the new Multi-Flame Lindewelding Head, which had its inception in the mid-continent field, has entirely superseded the single flame for all Lindewelding of pipe lines in that territory.

Proved Under Actual Conditions

In the heart of the mid-continent field, under the most adverse and grueling operating conditions, Multi-Flame Lindewelding literally went through a baptism of fire and emerged a perfected and accomplished technique. Here, this modern technique was tested, improved and rigidly retested with but one objective—to fill the industry's demand and need for more speed and economy in consistently producing good welds.

Saves Time, Rods and Gases

The enthusiastic acceptance of Multi-Flame Lindewelding by pipe line companies and contractors is due to its outstandingly greater speed, economy and ease of operation. It meets all field welding conditions, any size pipe, and wall thickness, jammed joints, excessive spacing, and high-low line-ups. Yet, important as these advantages are, the dominant fact is that with *the new Multi-Flame Lindewelding Head and the proper technique,* the average pipe line operator can effect *savings ranging from 15 to 40 per cent in welding time, rods and gases.*

Linde Process Service Cooperates

There need be no hesitancy in adopting Multi-Flame Lindewelding on your pipe lines. If you use Linde Oxygen, Linde Process Service Operators will help you organize your welding operations to secure the greater speed, efficiency and economy now possible with Multi-Flame Lindewelding. The development of Multi-Flame Lindewelding has conformed with the non-compromising standards set by Linde engineers since oxy-acetylene welding was first adopted for pipe lines. Standards that automatically require the work of development to be carried on in both the laboratory *and under actual operating conditions in the field.*

Lindewelding Performance Told in Pictures
SECOND RIVER CROSSING—With Multi-Flame Lindewelding this 8-in. line was laid across a river in one day—a notable record.
TIME IS MONEY—With Multi-Flame Lindewelding a saving of 25 per cent in welding time was made on this 10-in. pipe line.
FIFTY PER CENT INCREASE IN PRODUCTION was achieved on this 8-in. line. Six men averaged 304.6 welds per day with Multi-Flame Lindewelding.

You can order everything for Pipe Line Welding from Linde

LINDE OXYGEN... available in any amount from plants and warehouse stocks in all industrial centers.

PREST-O-LITE ACETYLENE... ready to use—the standard dissolved acetylene for well over a quarter of a century.

OXWELD APPARATUS AND SUPPLIES ... Oxweld offers the maximum value in oxy-acetylene equipment. Blowpipes, regulators, acetylene generators, welding rods, and supplies—are available for every welding and cutting operation. Complete stocks and service stations are located in all principal cities.

UNION CARBIDE... sold in the familiar Blue and Grey drum from over 250 warehouse stocks.

PIPE LINE CONSTRUCTION

Contact the Nearest Sales Office

The nearest Linde Sales Office will be glad to furnish complete information on Multi-Flame Lindewelding and the cooperation extended by Linde Process Service. Offices are located at Atlanta — Baltimore, Birmingham, Boston, Buffalo, Butte—Chicago, Cleveland—Dallas, Denver, Detroit—El Paso—Houston—Indianapolis—Kansas City—Los Angeles—Memphis, Milwaukee, Minneapolis—New Orleans, New York—Philadelphia, Phoenix, Pittsburgh, Portland, Ore.—St. Louis, Salt Lake City, San Francisco, Seattle, Spokane and Tulsa.

Everything for oxy-acetylene welding and cutting—including Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through producing plants and warehouse stocks in all industrial centers.

The Linde Air Products Company
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PERFORMANCE TELLS THE STORY

FIFTY Per Cent Increase in Production was possible with Multi-Flame Lindewelding on a line of 30 miles of 6-in. pipe with 5/16-in. wall, and 24 miles of 8-in. pipe with 1/4-in. wall. Multi-Flame Lindewelding was not available until after 14 miles of the 8-in. line had been welded. The remaining 10 miles of the 8-in. line was completed in three more days with Multi-Flame Lindewelding. This resulted in an average of 304.6 welds per day for six men which represented 50 per cent increase in production with no increase in personnel. Test welds were cut from the lines and given the reverse bend test. No welds failed in this test. This marked increase in production made the use of Multi-Flame Lindewelding on the longer 6-in. section a matter of course. The pipe was in 40-ft. lengths with 37½ deg. bevel. On this part of the line the six men averaged nine welds each per hr., or an average altogether of 4 miles per day in spite of sand and long moves. The line tested with 100-lb. air pressure proved absolutely tight.

Cross River in One Day. Another 8-in. line gives some further comparative data. The pipe lengths averaged 18 ft. and the weight of the pipe was 24 lb. per foot. The pipe in this case was from an old line and had been reclaimed by means of a pipe-cutting machine. Six welding operators were employed, four using the ordinary single flame blowpipe while two used the new Multi-Flame Lindewelding Head. The latter two attained a speed of 50 welds each per day, the former making but 40 welds each, or an increase of 25 per cent for Multi-Flame Lindewelding. One interesting section of this particular job was a 1500 ft. river crossing. By using special construction methods and Multi-Flame Lindewelding, the crossing was made in one day, a notable record.

Record of 89 Welds per Man Day. A prominent contractor in the mid-continent field has installed a number of lines with Multi-Flame Lindewelding. In one instance 30 miles of new 12-in. pipe were laid in 11 days. Considerable delay was experienced due to the nature of the country and river detours, so that several days were not worked full time. The six men on the firing line were averaging 30 or more welds a day even with these handicaps, and one day averaged 36.5. On a stretch of 8-in. pipe the same men averaged as high as 48 welds each per day, and on 6-in. pipe a record of 89 welds per man day was attained. Both 6-in. pipe and 8-in. pipe were 1/32-in. wall thickness, second-hand and beveled by a blowpipe cut. None of these welders had had much previous experience with Multi-Flame Lindewelding.

Saves 25 Per Cent in Welding Time. Still another contractor has been doing considerable work on 10-in. pipe of 1/32-in. wall thickness. On a 42-mile line laying new pipe in 40-ft. sections an average of approximately 38 welds per man day was obtained. There were four men on the firing line, each working on a string of five 40-ft. sections. The record made on this line with Multi-Flame Lindewelding represented a saving of 25 per cent in welding time over the older single flame tip.

ing is so constructed that any oil spilled thereon may be carried by drain lines to systems located on the shore.

In size, the average crude loading dock is relatively short in length, as compared to the length of the tankers served, being approximately 200 to 250 feet long and roughly "T" shaped in design. The short length of these docks is due to the fact that the loading of crude and liquid petroleum products requires but enough dock room to accommodate the loading hose, hose derricks and a very small amount of incidental equipment.

Various types of mooring clusters are located at both ends of the docks and in some cases additional mooring lines are run ashore to deadmen or dolphins. The ends of these mooring lines are sometimes placed on mooring platforms which are connected to the main structure by walkways to facilitate the berthing of a ship without resorting to the use of small motor boats in carrying the ship's lines to the dolphins.

Due to the destructive action of torpedoes or other marine type of borers, it has been found necessary in the construction of timber docks in salt water to use heavily pressured creosoted materials in all piling and timbers at or below mean low tide. It is also common practice to use less heavily creosoted materials on the superstructure.

Design of Tankage, Equipment and Lines

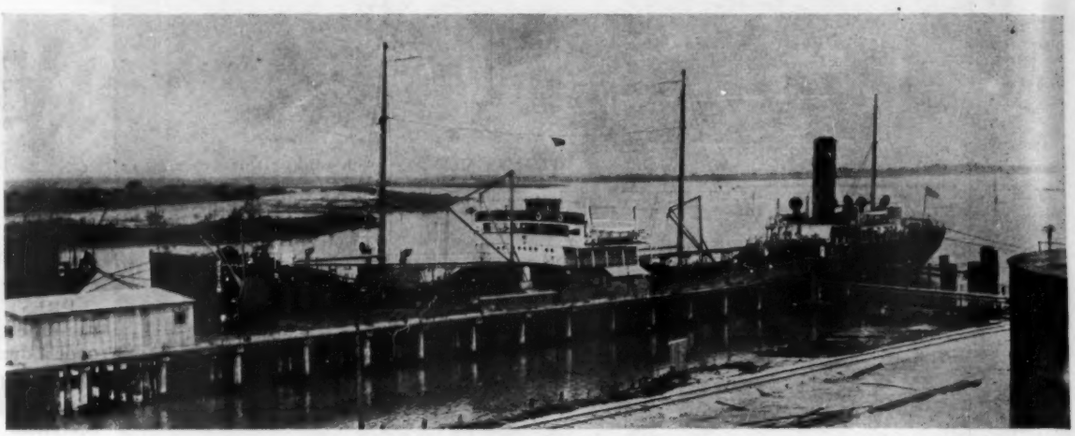
There are various types of designs used in selecting and laying out tankage, equipment and line arrangement for loading terminals, which is due principally to the topographical lay of the land. However, in the design and selection for all reasonably large and modern day terminals there are a few basic factors which have been more or less established through years of experience.

A great many oil terminals in the Gulf Coast area are found to be located on low and marshy ground, which in the majority of cases has a spoil fill up to as much as 15 feet necessitated by the dredging of slips and channels incident to the terminal. As a consequence the foundation of the site on which tanks, station buildings, equipment and lines are to be constructed is rather unstable and hence careful consideration must be given to the selection and design to preclude failures of completed structure. The general layouts on the site of loading terminals are very similar for the modern day terminal, which are composed of the station tankage, the number and capacity of which is dependent upon the size and requirements of the terminal, suitable pumphouse or houses equipped with pumps of various designs and types, and interconnected by adequate suction lines between tanks and pump house and loading lines through which oil is discharged to the ships, or from ships to shore. The above together with possibly accessory equipment such as ballast tanks, fire protection systems, bunkering facilities, etc., make up the present-day terminal.

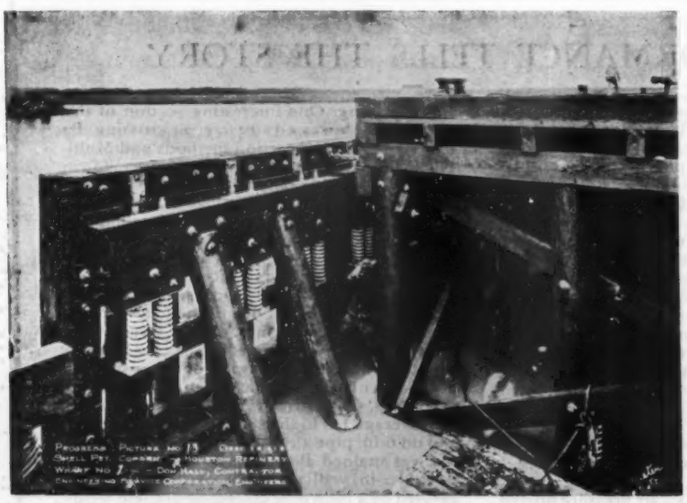
Tankage

In designing loading terminals, before proper selection can be made of the size and number of steel storage tanks, there must be taken into consideration the quantity of oil to be handled through the terminal, the number of different types and kinds of crude or petroleum products that must be handled separately, the hourly loading rate of the station and the average daily receipts into the terminal, either through pipe lines, by railway tank cars, or both. After decision is made as to the capacity of tankage required, it is then necessary to consider the soil conditions of the site in order to select the proper type of tanks best suited to local conditions. As above noted, it is seen that many of the terminal sites are originally selected on low marshy grounds, some of which have been filled to several feet elevation with spoil from the channel or slip, which fill is protected in a few cases by expensive bulkheads, usually of creosoted timber construction. The bearing of the soil thus obtained in such cases is unsuitable for the smaller diameter tanks unless some expensive foundation such as a concrete ring or piling has first been put down, and larger diameter tanks of lower heights have been found to be better suited to the bearing qualities of this type of soil without concrete or piling foundation.

In the erection of tanks at loading terminals, it is practically standard practice to protect the under side of the steel bottom of the tanks with some good protective coating to withstand the action of the salt or alkali that is nearly always present in the soil. Particularly is this true at the Gulf Port terminals and those terminals on rivers and channels not far distant from the open Gulf. The present-day A.P.I. standards of tanks offer a large variety from which selection can be made to fit practically any condition.



Typical loading scene



Showing in detail fender construction of dock at Deer Park on Houston ship channel

Station Equipment and Lines

The next component part of the loading terminal to be considered in design is the type of loading machinery, and this is dependent upon the kind of liquids to be handled, the hourly loading rate for which the station is to be designed, and the type of power to operate pump.

The type of pumping equipment most frequently found at all modern loading terminals in the Gulf Coast area for the handling of crude petroleum from Mid-Continent and Gulf Coast fields, together with other light petroleum products is the single stage centrifugal pump. The principal reason that this type of pumping equipment has found more or less universal favor has been because of its small size and weight for large volumes handled at low heads and correspondingly a low cost of investment per barrel capacity. Also it permits of closing the discharge gates against same while operating at full speed, this latter reason being a most important one in the loading of petroleum products to ship. It is not uncommon to see pumps of this type having capacity rates of from 5,000 to 10,000 bbls. per hour per unit, and even 15,000 bbls., with total heads up to 60 pounds pressure per square inch.

The direct acting piston type steam pump is still used at some of the smaller terminals for general work and at the larger terminals for the handling of bunkers to ship and other viscous oils. The advantage of the piston pump over the centrifugal in this type of service is that the centrifugal pump has a tendency to cavitate when handling liquids of over 1,000 viscosity and the overall efficiency greatly decreases with increased viscosity of fluid, whereas the piston type pump falls off only slightly with an increase in viscosity.

The chief disadvantages of the piston type pump for relatively large capacity rates, are its tremendous weight, requiring heavy foundations and correspondingly greater costs initially for equipment and setting, and also due to it being a positive displacement unit there always exists a serious hazard in closing the discharge gate against the pump while running, even though it is protected with the best relief valve equipment obtainable.

The third type of pump which is found in some plants for general cargo loading is the rotary pump, which will handle, somewhat like the piston pump, the more viscous liquids without as great a decrease in efficiency as with the centrifugal. Also the size and weight of this type pump for comparable capacities is much greater than the centrifugal and correspondingly greater initial investment cost. The rotary pump being a positive displacement unit also has the disadvantage of closing a gate against it, the same as described above for the piston type pump.

Pumps and Power

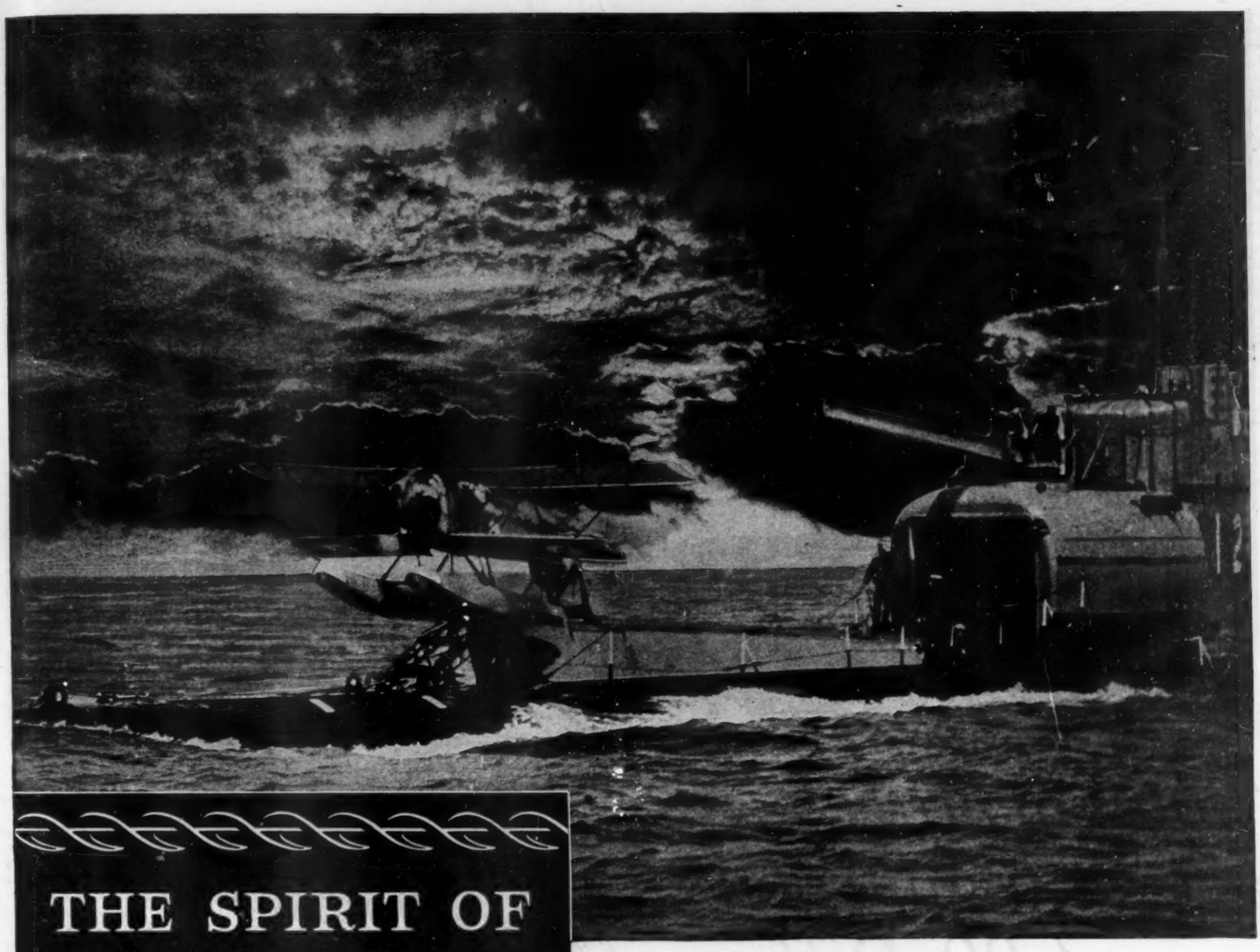
In most modern day loading terminals there will be found two and possibly three of the above type pumps, the centrifugal units being used for large capacity rates of average viscosity crudes and other petroleum products, while the piston and rotary pumps perform their duty in bunkering ships, loading cargo fuel and other heavy refined oils.

The power to operate loading pumps is generally steam or electricity. In the case of the piston type pumps the direct acting steam unit is considered most practical, while for the centrifugal and rotary units steam turbines or electric motors are used, the latter being most common. The selection of the type of motive power for centrifugal and rotary units depends to a great extent on the location of the terminal—that is, whether terminal is adjacent to a refinery where either steam or electricity is available at an economical rate or terminal located independent of such facilities, in which case a study must be made of the commercial power rates that can be obtained.

It will be noted above in discussion of the advantages of the centrifugal unit that high loading rates are common practice and although at relatively low heads the horsepower demand required is quite large, linked together with the fact that in ship loading requiring from five to ten hours time per ship with only a few ships per month, the load factor of the station is excessively low. Therefore, in contemplating electric power from an outside source, these factors, of course, must be taken into consideration and a selection made of the lowest rate obtainable.

There are certain instances of isolated terminals in the Gulf Coast area where the best power rates offered to meet with requirements of the consumer, taking into consideration the high operating KW demands and low load factors, were from an economic standpoint too high, and as a consequence the companies constructing the terminals found it feasible to construct their own Diesel or turbine-driven generating plants for the supply of power.

It is beyond the scope of this article to set forth any definite figures as to what earned rate for energy a consumer should get for power furnished him at



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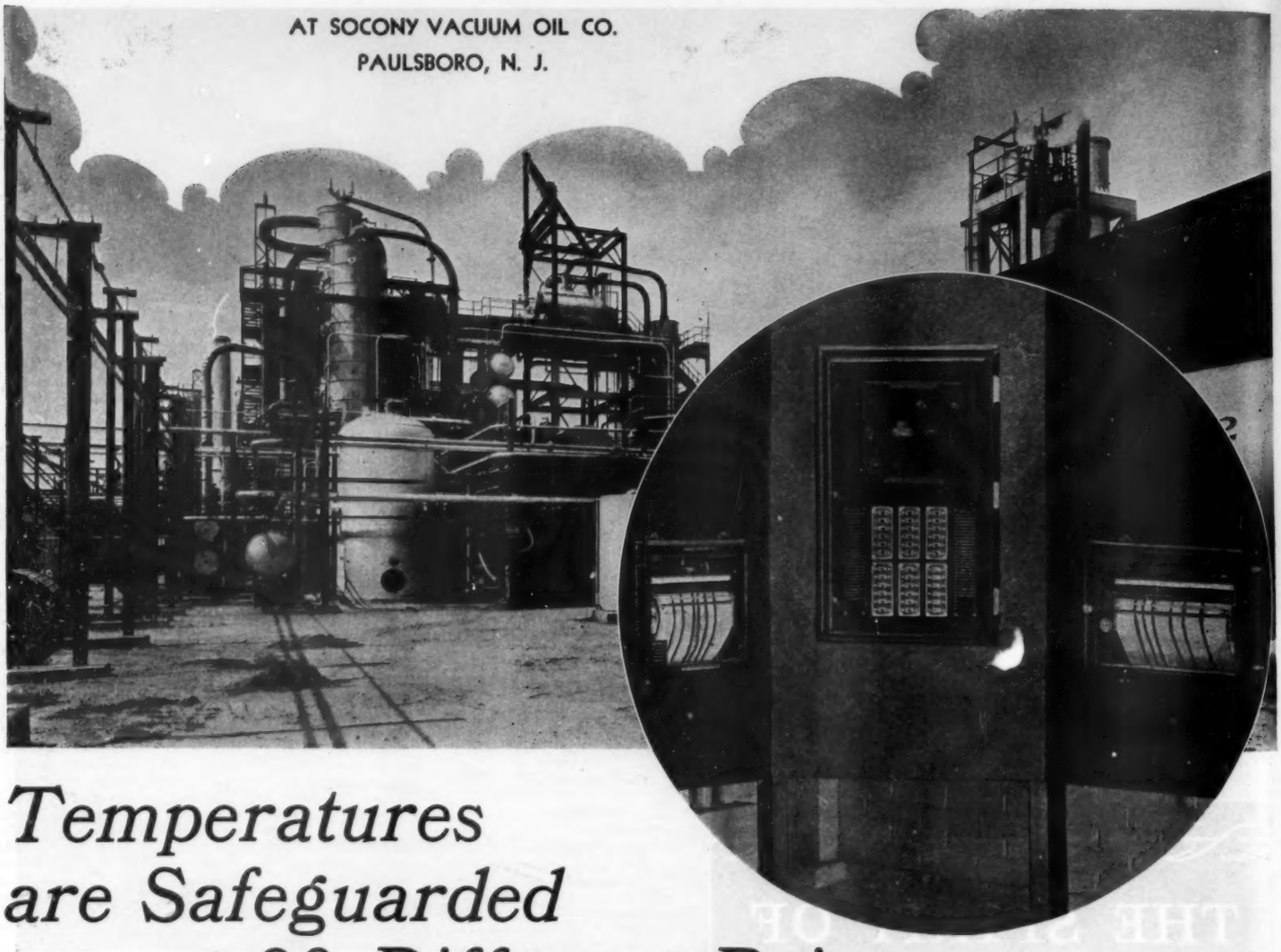

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the loading terminal, as the factors governing such are quite varied, and it is strictly a question of each plant standing on its own feet at the time of planning and designing. Unquestionably the use of motor driven pumps offers many advantages over other types of motive power such as steam or Diesel engine driven, as it will permit the use of smaller and lighter equipment, thus requiring smaller foundations and smaller initial investments, and is more flexible.

Layout of Pumping Equipment

The layout of the station pumping equipment as related to the tankage is of importance, in that these component parts of the terminal should be as close to each other as is practical in order to make short suction lines through which the large capacity per hour rate must flow. Also the location of delivery pumps as related to the loading dock should bear the same relation as station and tanks in order to minimize loading lines and keep total operating discharge pressures of units as low as economically possible, which correspondingly means lower operating demands and energy consumption. It is thus seen that in the relative layout of the terminal between the three component parts—namely, tankage, station pumps, and docks—that careful consideration to design and planning must be given in order to reach an economic balance between investments of equipment and operations thereafter.

The suction lines from tanks to pumps vary from 12 inches to 20 inches, and in some cases even larger, depending on the loading rate of the station and kind of crude handled, while the discharge lines ordinarily vary from 8 inches to 16 inches, depending on conditions. In general practice, the more modern type of docks have loading lines extending the full length and to the back of the dock with both single and twin outlet connections spaced at intervals of from 50 to 100 feet, from which strings of flexible hose are connected to ship. This arrangement on docks facilitates greatly the loading of ships' compartments, fore, aft and amidship, with the least possible delay.

In addition to the line arrangement for cargo loading and unloading, there is usually found a separate line for use in handling bunkers to the ship, together with high pressure fire line and separate line for supplying ship with fresh water. In cases of terminals adjacent to refineries there will usually be found a steam line on the back side of dock for additional fire protection, and to furnish steam to tankers while their fires are extinguished. Various types of derricks for the handling of the hose lines to ships are also provided.

Miscellaneous Equipment

At most oil terminals precautions are taken and provisions made to take care of oil spilled on docks while loading as well as to handle the remaining ballast from ships when same are docked, which ballast is pumped through lines provided to a tank permitting the settling out of same for reclamation. Steam is sometimes provided for accelerating the treatment of ballast from ships.

There is telephone communication between the land pump station and docks at all modern terminals which is used chiefly by the dock men in keeping in touch with the station engineers for varying and controlling the rate of pumping and for starting and stopping the pumping of cargo. The telephone systems are equipped with claxon horns for calling different parts of the terminal and for signalling employes at the terminals. Each terminal has its own system of calls.

Fire Protection

The loading of petroleum products over shipside is a very hazardous business at best and at all modern terminals there will be found to a varying degree efficient fire protection systems capable of meeting most any reasonable emergency. Around practically all terminals located adjacent to refineries and at the larger terminals irrespective of location will be found adequate foam protection covering tanks, station pumphouse and docks. As noted above under discussion of line arrangement, some docks, in addition to foam systems and high pressure water, are equipped with steam lines, offering additional protection from fire.

In addition to the general foam system throughout the plant, high pressure water lines and steam lines, there will always be found on the docks of up-to-date terminals, adequate hand and portable fire extinguisher equipment located at convenient and accessible points. This equipment, although auxiliary in its performance, obviously represents a considerable part of the overall cost of an oil terminal.

Safety Measures

Fire, of course, is considered the greatest menace to property and life but in addition there are natural hazards to life due to the conditions under which men are required to work. At many docks night time as well as day time loading is permitted and when taking into consideration the speed with which connections and loading must be made, certain measures for the safeguarding of men working around terminals are necessary and, therefore, careful consideration is given to the design of plant and deck. First, of course, the usual "no smoking" and "safety first" signs of conventional type are placarded conspicuously throughout the plant and docks. Adequate walkways well protected with guard rails and inspected frequently are of prime importance, particularly those sections of walkways running from main dock structures to mooring clusters on either side of dock.

Consideration is also given as to proper lighting for night operations. There are several types of lighting systems throughout the Gulf Coast area, but all of them embrace as near as possible the system of diffused or indirect lighting that will not make a glare to the men working on the docks or on the ships, or to the ships as they come in at night for berthing.

Operation

The promptest dispatch possible is always given to vessels carrying oil cargoes and prior to the arrival of vessel at the docks of an oil terminal, all work incidental to the loading that can be done is taken care of. The inspection of the oils to be loaded is made and suction gates and pumps are lined up. The inspection of the oil in most cases is made in compliance with A.P.I. regulations and is handled by a licensed petroleum inspector and the supplier's gauger or by representatives of the supplier and consignee jointly. In cases of intercompany shipments the inspection for quality and measurements for quantity are usually made by one or more of the terminal's gaugers.

Accurate testing equipment is furnished for terminal use and the utmost care is exercised to prevent errors in gauging and testing. In addition to the gauging and taking of temperature in the shore tanks, these tanks are thieved before and after loading by the cargo inspectors to make sure that no bottom sediment or water has been loaded aboard ship. Tank swing lines are also carefully checked before loading. A different method of gauging is used at loading terminals than that employed elsewhere in gauging oil. This is the outage method. The standard gauge line is used but is equipped with an outage bob instead of the usual pear-shaped bob. This bob is lowered into the oil and the reading on it added to the reading on the line made at a fixed reference point on the gauge hatch. This total is then subtracted from the height of the tank at the reference point to determine the innage or height of the oil in the tank.

Due to the many different grades of oil handled through most terminals, it is necessary to use the same suction and discharge lines for these different grades, and the lines are checked and accurately displaced with the grade of oil to be loaded. All of this work is usually taken care of before the arrival of the ship.

Methods of Loading

Upon the arrival of the ship at the dock, the ship's lines are, in most cases, made fast to the mooring cleats, davits or hooks by boatmen who have a fixed charge for this service. Where boatmen's associations are not available, this mooring assistance is rendered by the terminal's forces. As soon as the ship is moored, the oil inspectors board it and inspect the ship's tanks or compartments to make sure that there will be no contamination from fluid that may have been left in them from prior loadings or from remaining water ballast. They also line up with the ship's officers the procedure to be used in loading. Every ship loaded is a different problem due to the various types of petroleum products loaded. Crude and light oils are always loaded through the ship's manifold and usually only one grade is loaded at a time. Lubricating and fuel oils are loaded either through the ship's manifold or through hose dropped into the ship's tank hatches and several grades may be loaded at one time.

Hose connections from the shore lines to ship's lines or compartments are made by the terminal's force. There is usually a small connection gang of about six men maintained by the terminal for this purpose and also for plant maintenance work. To connect the five or six strings of 8-inch hose ordinarily used for fast loading only requires from 5 to 10 minutes and by the time the inspectors are through with the ship inspection, everything is in readiness to start the cargo.

There are many factors that enter into the rate of speed with which loading may be maintained; such as ship's lines, manifold, number of hose connections available, grade and number of kinds of oil to be loaded, etc. The modern terminal, however, is flexible enough to meet all of these conditions and may be called upon to load from only a few thousand to as high as 30,000 bbls. an hour.

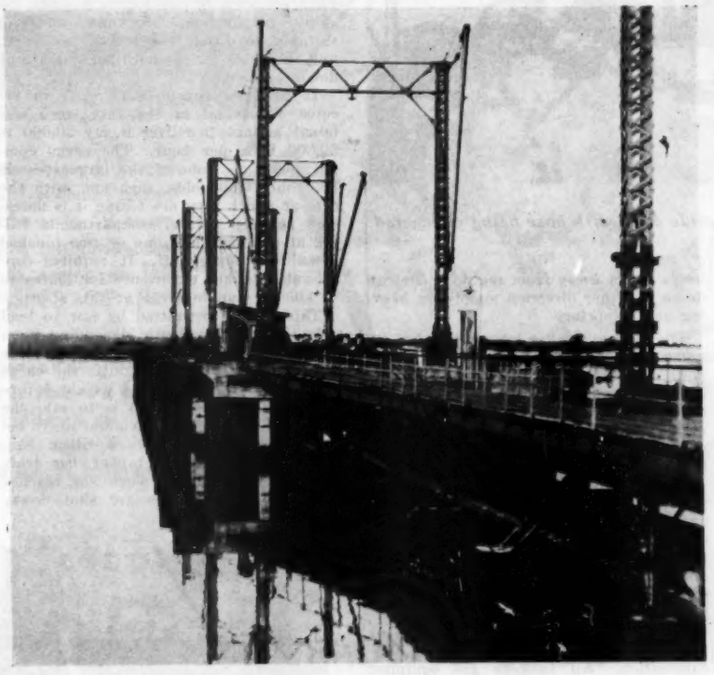
The number of employes necessary for the operation of the terminal depends upon the volume and grades of crude loaded. The typical set-up for the larger oil terminals is usually a superintendent or dockmaster who is responsible for the operation and maintenance, an assistant dockmaster who is responsible for and in charge of the docks at night, a rotating shift of dock helpers whose duties are to handle the dock hose and telephone communications from the ship to pumphouse; such as starting, stand-by and shutdown orders. The force ashore is composed of a rotating shift of engineers or pumpmen and also helpers who run the pumps and "line up" all shore gates, make displacements, etc. There is also a rotating shift of gaugers who make the cargo inspection as previously mentioned and, in addition to this, the necessary connection gangs for connecting hose and maintenance work. Maintenance work at terminals located on the salt water bays in this area is extremely heavy due to atmospheric conditions such as heavy fogs and the salt atmosphere which make necessary almost continuous painting to prevent destruction of equipment from rust and corrosion.

Many serious oil dock fires in the past have taken their toll of life and property and from these safety methods have been learned.

The utmost precautions and the best available protection against fire must be maintained due to the high rate of loading and the explosive nature of the oils handled. At many terminals the loading of gasoline is not permitted until all fires aboard ship have been extinguished and night loading is prohibited. The ship's crew must eat their meals ashore during loading and steam for the ship during this period is furnished from ashore. These precautions, however, are not taken while loading other oils. Shore lines are grounded for static electricity and the ship is grounded to the shore lines before hose connections are made. Tow boats and other craft with fires aboard are not permitted alongside during loading. Fires in the vicinity of docks are not permitted and smoking on the decks of vessels and docks is prohibited. Shore and dock crews are drilled in the use of fire fighting apparatus provided and regular tests of this equipment is made both to determine its working order and to keep the men familiar with all details in connection with its use.

Marine Practice

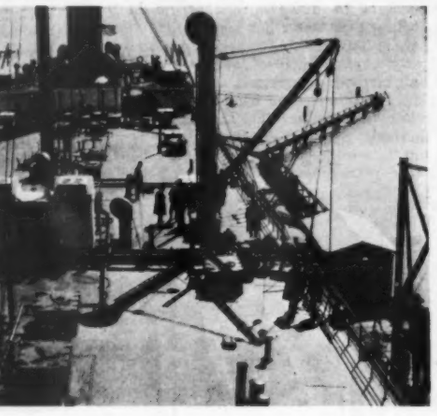
The necessity of transporting petroleum in bulk was occasioned by the demands of the home and foreign markets for a safe- economical method of han-



Typical loading dock

dling and transporting the products. The first petroleum was transported in wooden barrels; and subsequently, to reduce the tare weight of the containers and permit of more economical stowage, rectangular shaped metal containers were used. Considerable leakage of the petroleum from the containers with the attendant danger of explosive gases formed through this leakage and the great relative cost of handling in this manner directed attention to the possibility of handling and transporting the petroleum products in seagoing bulk oil carriers.

In 1884 a practical means of transporting bulk petroleum was developed by building into the sailing ship "Andromeda" 72 metal tanks which were made integral with the vessel's bulk structure.



The deck of a modern tank ship—alongside dock with hose being connected

The success of this venture prompted the development of seagoing steamers arranged for carrying petroleum in bulk, the hull of the steamer itself forming the receptacle within which the oil could be carried. We have today over 1,500 tankers representing a deadweight carrying capacity in excess of 3,000,000 tons, of which the largest has a capacity of 24,000 tons deadweight. By deadweight is meant the total carrying capacity of a vessel in long tons and it includes in addition to her cargo all fuel oil, fresh water, stores and spares.

The present day tankers carry a crew of from 34 to 45 men depending largely upon the size of the vessel and whether or not she is propelled by single or twin screws. Of this complement there are in addition to the master, three licensed deck officers, and in addition to the chief engineer, three licensed engineer officers.

Upon a vessel's arrival at the entrance of the harbor she is generally met by a licensed pilot who boards the vessel and directs her to the dock. It is possible under certain circumstances that a master with a pilot's license may handle his own vessel, but in the majority of cases pilotage is taken care of by a member of the local pilots' association or by a resident employe of the owner.

Somewhere along the route between the open Gulf and the dock the vessel is met by one or more towboats which assist in maneuvering and in docking. The use of towboats depends to a great extent upon the waterway traversed, but in most instances towboats are required off dock to turn and assist the vessel to her berth.

While navigating inside waters and docking or undocking it is customary for the chief officer to take his place on the forward end of the ship or forecastle, the second officer on the aft end of the ship or poop, and the third officer with the master and pilot on the bridge.

Mooring the Tankers

When the vessel arrives off of the dock, light lines with weighted ends or "heaving lines" are thrown to the dock. These are attached to vessel's regular mooring lines which are then hauled in by the shore forces and made fast to mooring dolphins. As a rule mooring lines are 7 inches to 9 inches in circumference and the vessel will put out two or more bow lines leading forward, two or more stern lines leading aft, breast lines, forward and aft to mooring clusters behind the dock to hold the vessel close to the dock and two "spring lines," the back spring and the forward spring. These run parallel with the ship, one from the forward part of the ship to the face of the dock at the aft part of the ship, and the other one from aft to forward, and their purpose is to keep the ship from moving back and forth from swells caused by passing vessels. In many cases wire cables are used for spring lines so in case of fire and the ship needs to get away from the dock she can do so in either direction simply by heaving on the spring.

The present tanker is exactly what its name implies; a huge vessel with buoyancy spaces forward and aft, machinery space generally aft, and the better part of the length of the vessel a huge shell divided into compartments by one or more bulkheads running fore and aft and by cross bulkheads. A present day tanker will have from 20 to 40 compartments formed by these bulkheads. The fore and aft bulkheads are a requirement for stability and the cross bulkheads are a requirement for seaworthiness primarily and, to a certain extent, stability. In a well built and well maintained tanker these bulkheads are oil tight and permit the shipment of different grades of cargo in the same vessel without contamination. All tankers are equipped with one or more pumprooms which contain not only the equipment for discharging vessel's cargoes but the manifolds through which cargo is distributed to the several compartments by pipe line.

Each compartment has its own hatch with a hinged oil tight cover. As covers are very heavy and difficult to handle each cover has its own inspection hole, a smaller round hinged hatch which can be easily raised or lowered during loading operations. If there is any question about the suitability of ship's tanks for cargo upon arrival all hatch covers will be lifted upon arrival, then lowered before loading is started. In few cases are vessels loaded with the hatch tops open, and at such times as hatch tops are down and inspection holes are in use, they are covered with flame arresting wire screens.

As a general rule gas accumulating during loading is vented from each compartment to a common vent which runs up the mast and discharges high in the air. A few vessels are equipped with carbon monoxide systems whereby nonflammable stack gases are run through the compartments and the compartments are at all times gas free and the loading displaces only carbon monoxide.

General fire protection is a steam smothering system, each compartment having a steam line running directly to a main steam header which runs the length of the vessel. Individual valves to compartments are at all times open and in case of fire in any one compartment, a master valve on deck adjacent to the boiler room is opened, blanketing all tanks with steam. Some of the later tankers are equipped with regular fire extinguishing gases instead of steam.

Loading the Vessel

In loading the vessel a flexible hose is connected to a loading line on deck, as a rule near the pumproom, and petroleum is run through the pumproom manifold to the various ship's compartments. Cargo lines extend the length of the ship inside of the compartments 3 to 4 feet above the bottom and these fore and aft lines have individual branches to each compartment, each branch having its own valve. A well-run ship will be ready for cargo upon arrival, her boom will be rigged to hoist the shore hose aboard, and all valves to compartments which first take cargo will be "lined up." It is the duty of the shore force to connect the hose and in many instances they are aboard the vessel, have manned the winch, hoisted the hose aboard, connected and started loading before all the ship's mooring lines are out, virtually before the ship is all fast to the dock. Such dispatch is possible only when the ship's compartments are known to be in suitable condition to receive her cargo and therefore arrives with her hatch tops down.

It requires considerable skill to receive a product at the rate some terminals are able to deliver it, say 20,000 to 30,000 bbls. per hour. The cargo compartments on some of the larger vessels hold only 6,000 bbls. each and with the rate at which they are filling it is necessary to keep several compartments filling at one time and one or two pinched down for topping off. It requires considerable tanker experience for mates to be able to handle cargo at this speed.

Tankers are permitted by law to load only to a certain depth, depending upon the size of the tanker, her trade and the season of the year. Generally, the cargo reaches the ship's limit of weight before her limit of volume, that is to say, she will be down to her maximum draft before all compartments are filled. Accordingly, in loading a tanker, her draft must be watched and when she reaches her load draft, pumps are shut down, hose cast off and the vessel is ready for sea. By this time all compartments will have been loaded and topped off with the exception of the foremost and aftermost. One or both of these are generally slack and cargo may be transferred in either direction, i.e., fore or aft for trimming purposes. Most vessels like to sail with a slight "drag," that is, with the stern a foot or more deeper than the bow. As fuel oil is stowed aft and the ship will burn from 150 to 200 bbls. of fuel per day, it is not unusual for cargo to be transferred from forward to aft in the course of a voyage to compensate for the fuel burned and to keep the vessel in best trim for navigation purposes. In many instances, limiting depth of water requires a vessel to load to even keel to obtain maximum cargo. If drag is desired, cargo is transferred from forward to aft after vessel reaches deep water.

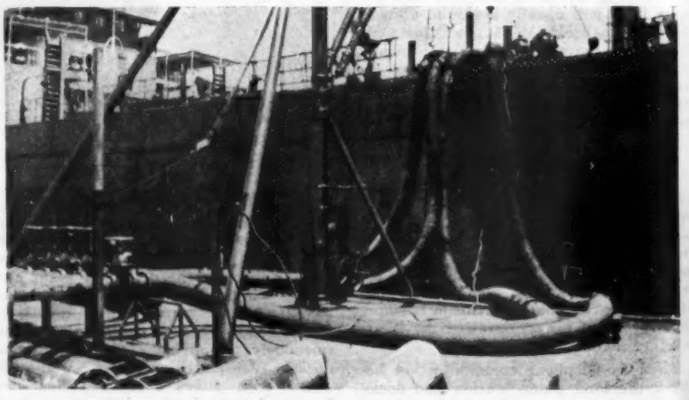
Commercially, so far as business in this country is concerned, tankers are divided into two classes, American and foreign flag. The foreign flag vessels can trade only with foreign ports.

American vessels are certificated by the United States in two classes, i.e., registry and enrollment. A vessel in the latter class may trade between American ports without the necessity of reporting to the government authorities; however, she may not trade foreign, and should the owner have an American flag vessel which he wishes to place in the foreign service it is necessary that the vessel be placed under registry. A registered vessel must report to the proper government officials at each call in port regardless of whether it is trading with foreign countries or trading between American ports.

While the vessel is loading, therefore, it is often necessary for the master to report to the custom house for ship's business. The master reports the quantity and grade of cargo loaded or discharged, consignor and consignee. In cases of a vessel in the foreign trade, a considerable number of documents are required both from the customs and from the consul of the country to which the vessel is bound.

Vessels arriving from a foreign port must first be inspected by the quarantine officials, then the immigration and the customs before anyone is allowed to board them. The majority of American flag vessels are now in the coastwise service and under enrollment, and there are, therefore, no government formalities whatever in connection with their business, other than an annual inspection by the U. S. Steamboat Inspection Service.

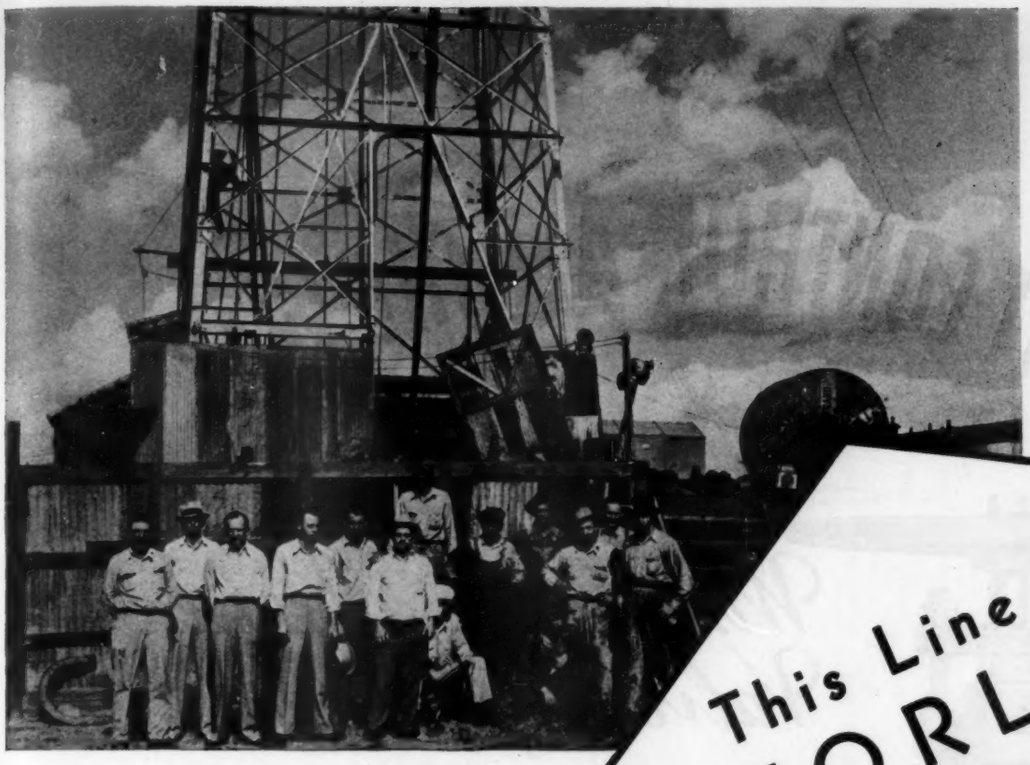
All American vessels which trade on the high seas are under the supervision and surveillance of the United States from the time the keels are laid until they are scrapped. At the time of their construction they are subject to the laws and regulations of the U. S. Steamboat Inspection Service. The U. S. steamboat inspectors are interested primarily in the safety of men at sea and their inspection of a vessel during the period of its construction and thereafter once each year insures maximum safety to the crews and to the vessels themselves.



Hose connections to one of the large tankers. These are 8-inch rubber hose. Note the hose handling derrick and also the static bonding wire

OIL BURNER CODE ALTERED

The National Recovery Administration announced October 1, that manufacturers of distillate burners have been exempt from the code for the oil burner industry, and will be covered by a proposed supplementary code for the liquid fuel appliance manufacturing industry. This code is now under consideration.



"Flex-Set" Preformed Yellow Strand Rotary Drilling Line helped make history at Gulf Production Company's No. 103 McElroy. In 19 hours, without a hitch, this 1⅛-inch line ran and landed 10,301 feet of 7⅝-inch, 34-lb. casing — THE LONGEST STRING OF CASING OF THIS SIZE EVER RUN.

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Broderick & Bascom Rope Co.
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This Line Set
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String of 7⅝-in., 34-lb.
CASING
10,301 FEET

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"Flex-Set" Preformed Yellow Strand Rotary Drilling Lines

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Wins Races....Insures Valve Performance

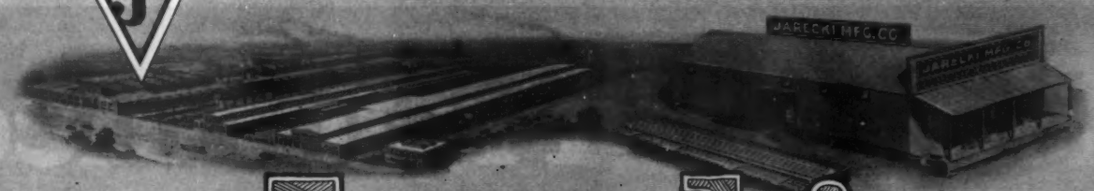
JARECKI SEMI-STEEL GATE VALVE
500 lbs. Oil, Water, or Gas Working Pressure.

Expert control—ALL the way—is the secret of success in yacht racing. Expert control—ALL the way—is also the secret of the success which Jarecki valves and fittings have achieved in the petroleum industry.

The Jarecki Manufacturing Company, whose experience in the manufacture of valves and fittings dates back to 1852, expertly controls every step in *manufacture*, from raw materials to finished product.

Jarecki then controls the *distribution* of its products to the oil industry through its own branch stores in all important fields, and our representatives are available to service them throughout their period of use.

This expert control—ALL the way—helps to account for the enviable reputation which Jarecki Valves and Fittings have achieved.



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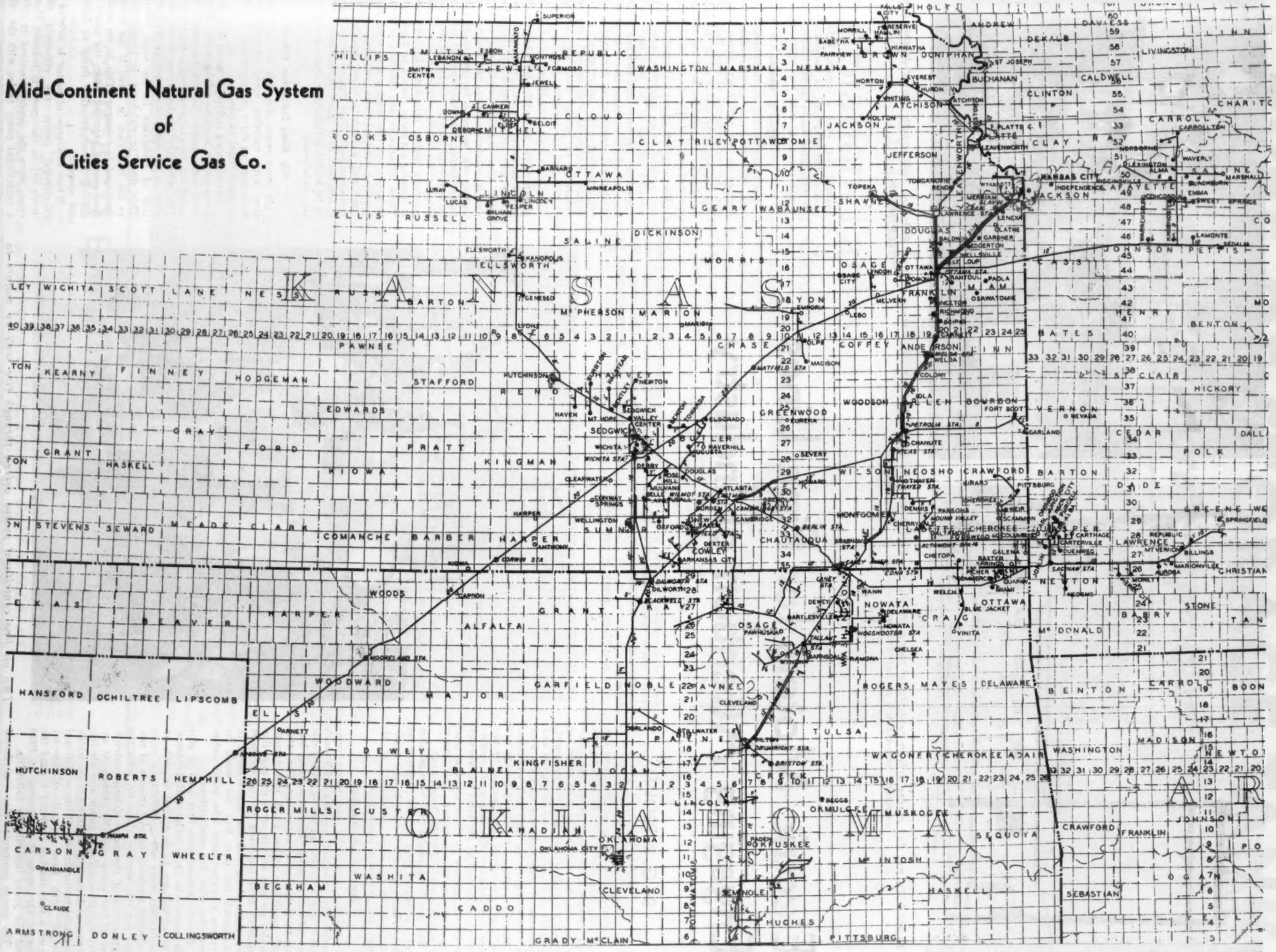
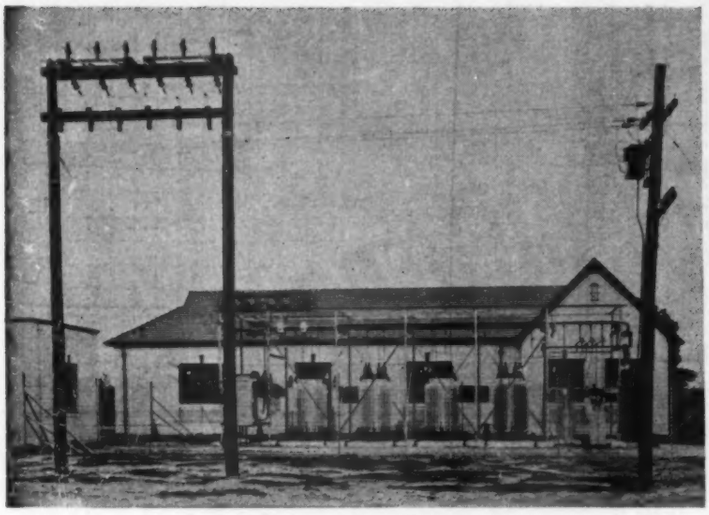
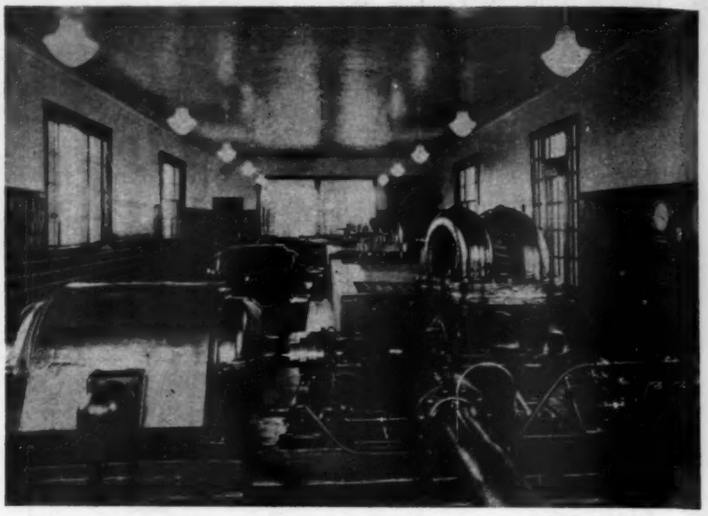




40,000 bbls. per day motor driven centrifugal pump station showing power company sub-station in foreground



Interior view of station. Three 400 h.p. 3600 r.p.m. motor-driven centrifugal pumps

Electric Motors for Pipe Lines Engaging Attention of Industry

By G. R. PROUT
General Electric Co.

During the past year or two there has not been very much activity in pipe line construction. However, pipe line engineers and executives have been watching closely the development of equipment, methods of construction, maintenance and operation of pipe lines, all with the idea in view of improving their own situation.

Electric motors for driving pumps are no longer considered experimental by the pipe line industry. The degree of acceptance is evidenced by the total horsepower in electric motors in oil or gasoline pipe line stations now installed. This figure is approximately 200,000 horsepower.

The power companies have transmission lines covering most of the country so that reliable electric service is now available or can be made so readily at almost any proposed location.

Better Understanding

Pipe line companies and power companies, by constant contact with each other over a period of years, have come to understand each other's problems better, to their mutual advantage. The rates and conditions under which power companies are now able to serve the pipe line industry have improved during the past few years along with the improvement in equipment for pipe line use made by various manufacturers who build equipment for pipe line applications.

Electric motors were first used in pipe line service to drive reciprocating pumps. The advantages to be gained by such an application were not sufficient to cause a general tendency toward the use of motors for this service. However, with the appearance of the motor driven centrifugal oil line pump and the subsequent activities of centrifugal pump and electric motor and control manufacturers which produced motor driven oil line centrifugal pumps with good overall efficiencies, came a very marked tendency toward the use of this type of equipment in 1926 and the years immediately following.

The power companies also contributed largely to this movement by extending their transmission systems over wide areas which made reliable, economical electric service available to pipe line systems.

The centrifugal pump is essentially a high speed machine when handling large volumes at high pressures, such conditions as obtain in pipe line practice. The high speed electric motor is easily designed and built. Consequently it was natural that such a simple, light, inexpensive pumping unit as the electric motor direct coupled to the centrifugal pump would appeal to pipe line operators.

Two oil line centrifugal pumps driven through fire wall by motors in engine generator type pump station

Types of Motors

Until the advent of the gasoline pipe line, the constant speed motor direct coupled to the centrifugal pump largely met the requirements of pipe line pumping. Consequently nearly all of the equipment now in operation is of the constant speed type.

The simplest type of electric motor is the squirrel cage induction motor. This machine consists of but four main parts, the stator, the rotor and two end shields, each of which contains one bearing. The mechanical simplicity of this type of motor, together with its relatively simple control equipment and its low first cost, caused it to be the most popular type of motor in the pipe line industry.

In some cases, particularly where the power costs depended somewhat on the power factor of the load, the synchronous motor with direct connected exciter was used. This machine, while not quite so simple, mechanically, as the squirrel cage motor, can be made to operate at unity power factor. The efficiency of this type of motor is usually slightly higher than that of the correspondingly rated squirrel cage motor, although this difference is usually not more than 1 to 2 per cent. These advantages are obtained at an increased first cost and a somewhat more involved motor which requires an exciter and a slightly more complex control equipment. This type of motor, where it has been used, however, has been found to be highly satisfactory from the operating standpoint.

Slip Ring Induction Motors

In some cases, slip ring induction motors with variable speed control have been used to drive reciprocating, as well as centrifugal pumps.

The slip ring induction motor is a relatively simple machine mechanically. When used with proper control equipment its speed can be changed over a wide range. The efficiency of the motor drops, however, as the speed is reduced by the insertion of resistance in the rotor circuit. This drop in efficiency is proportional to the reduction in speed if the torque developed is constant. This is the condition usually obtained when the motor is driving a reciprocating pump at different speeds.

When this type of motor is driving a centrifugal pump, the efficiency also drops off as the speed is reduced. However, since the power required to drive a centrifugal pump varies with the cube of the speed, the motor losses are ma-

A TYPE OF STORAGE TANK

—to meet every evaporation problem

Above: Wiggins Pontoon Roofs on storage tanks at large pipe line terminal. Lower left: 20,000-bbl. Hortonspheroids on a gasoline pipe line.

For Terminal or Station Tanks

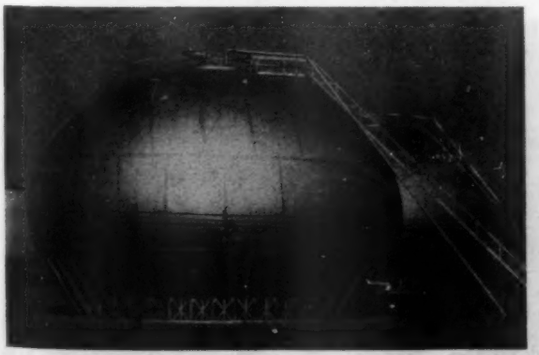
Handling Crudes or Gasolines

PIPE line operation involves many conditions of handling and storing which expose the product to evaporation loss. Every time a station tank is filled or emptied, every day that a product stands in storage, every blending operation—all these and others involve serious losses unless adequate protection has been provided.

The type of protection which is necessary and economical depends on the product and the climatic conditions. The most common installation on pipe lines is the Wiggins Pontoon Roof which is adaptable to tanks of any size and is capable of stopping practically all evaporation loss from products which do not boil at atmospheric pressure. These roofs can be installed on either new or old tanks. Many modern pipe lines are equipped with them from end to end.

The design of the Wiggins Pontoon Roof is based on the simple idea of keeping air out and oil vapor in the tank. As long as such a mixture is avoided, there can be no appreciable evaporation loss because vapor cannot escape and air cannot come in contact with the oil surface to take up vapor and carry it away.

The operation of the roof is as simple as the principle, it floats on the liquid, moving up and down with changes in level of the tank contents. The effectiveness of this floating roof is assured by a seal between the roof shoes and the tank shell, by the unsinkable Pontoon construction and other details developed through years of service.



Pressure Storage for Light Products

But modern pipe lines are called upon to handle many natural and high test gasolines which frequently boil at atmospheric pressure. Evaporation loss from such products cannot be prevented except by storage in pressure containers. Hortonspheroids are used on pipe lines to meet this condition and their effectiveness has been amply demonstrated for products with a vapor pressure from 20 to 30 lbs. per sq. in. absolute at 100° F.

One oil company with 11 Hortonspheroids in service, 9 of which are on its gasoline pipe line, reports that the vents—set for 15 lb. internal pressure—seldom if ever have opened at any of these locations. The other two, used for storing blending stock, are connected to the intake of the compression plant but it is doubtful if any gas is taken from these containers.

We have had years of experience in studying evaporation problems and building equipment to solve a wide variety of such problems. Whenever you are considering evaporation losses, let our nearest representative give you the available facts. This evaporation engineering service is free and involves no obligation. Quotations gladly furnished on any tank, roof, or other steel plate work.

THE HORTONSPHERE
for 20 Lbs. pressure and up
THE HORTONSPHEROID
for 10 to 20 lbs. pressure
THE RADIAL CONE TANK
for 5 to 10 Lbs. pressure
WIGGINS PONTOON ROOFS
for working storage tanks
WIGGINS BREATHER ROOFS
for standing storage tanks

CHICAGO BRIDGE & IRON WORKS

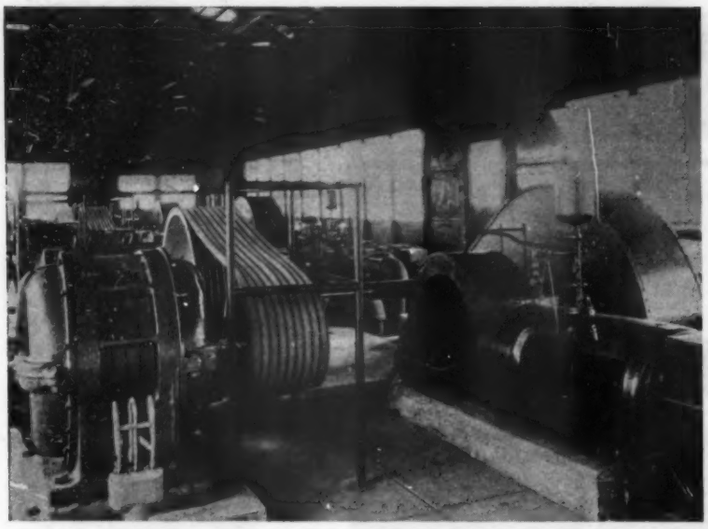
DALLAS	1241 Burt Bldg.	CHICAGO	2128 Old Colony Bldg.	PHILADELPHIA	1615 1700 Walnut St. Bldg.
HOUSTON	2919 Main Street	DETROIT	1514 Lafayette Bldg.	BOSTON	1517 Consolidated Gas Bldg.
TULSA	1606 Thompson Bldg.	CLEVELAND	2204 Rockefeller Bldg.	SAN FRANCISCO	1054 Rialto Bldg.
BIRMINGHAM	1536 Fiftieth St., N.	NEW YORK	3347-165 Broadway Bldg.	LOS ANGELES	1423 Wm. Fox Bldg.

Fabricating Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PA.

terially less when driving this type of load than when driving the approximately constant torque load of the reciprocating pump.

The higher first cost and the decreased efficiency when operating at reduced speeds, has limited the use of this type of motor to a relatively few installations.

In a few cases, slip ring motors are being used on reciprocating pumps for convenience in operation. In several instances these motors were installed on single stage centrifugal booster pumps to provide a means of maintaining constant maximum station discharge pressure throughout the year, regardless of the viscosity of the oil being pumped. In these cases the main pumps were centrifugals driven by squirrel cage motors, while in each station a full capacity single stage booster pump driven by a slip ring motor was installed on the suction side of each station. The station discharge pressure was kept at a safe maximum by changing the speed of the booster pump as the viscosity of the oil changed.



Three 150 h.p.—720 r.p.m. squirrel cage motors driving reciprocating pumps in oil pipe line pump stations

Motors in Gasoline Lines

Where pumping requirements vary materially from day to day or season to season, as frequently happens in the gasoline pipe line, the brush shifting type of adjustable speed A-C motor has the advantage of permitting wide speed adjustment without the large loss in efficiency obtained in the slip ring motor.

The horsepower and speed limitations of this type of motor, as well as its relatively high first cost, limits the possibilities of its wide use. Nevertheless there are certain applications where it fits in the economic situation well and undoubtedly it will be more widely used in pipe line service. This is particularly true for gasoline pipe lines.

The brush shifting type of motor, as well as the synchronous motor and the slip ring motor, require a fire wall to be constructed between the motor and the pump in order to assure the prevention of fire by sparking at the motor brushes igniting an explosive mixture.

The squirrel cage motor has been installed in the pump room without a fire wall between it and the pump, in a very large number of cases. So far as we know, there have been no fires in any pump station that could be traced to the motor or control equipment for its origin.

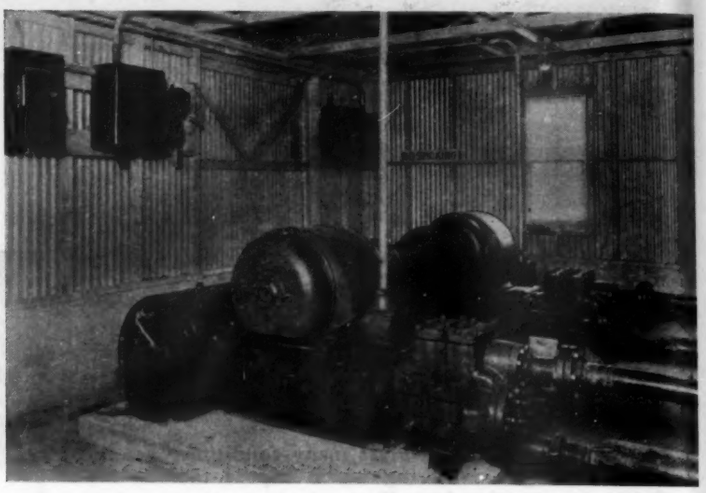
Explosion-Proof Motors

Various forms of the above mentioned motors are being used on pipe lines. The so-called "explosion-proof" motor in small sizes is being widely used in refineries, gasoline bulk stations and loading racks. These motors have the approval of the Underwriters' Laboratories for use in explosive atmospheres created by the mixture of petroleum gases and air. In the large sizes, the Underwriters' Laboratories have not been able to give approval because of the lack of facilities for testing large motors. Nevertheless large motors of this type have been built and are now used in hazardous locations.

In some cases motors of the base ventilated construction have been used. In this type of construction, fresh air from outside the pump station is drawn in through a duct to the end shields of the motor, where it passes into the motor. It then is forced over the coils, through the motor and out through openings cored in the feet of the motor and base. This type of construction is expensive but the fire hazard is materially decreased.

Another type of special design and construction of motor that has been used on gas and gasoline pipe lines is of the enclosed type where the gas or gasoline being pumped is used as a cooling medium for the motor. This type of construction is very special but has been used successfully. One gasoline pipe line has used a number of motors of this type.

One interesting installation was made in Kansas by a gas pipe line company. This installation consisted of a 3,000-horsepower synchronous motor driving a centrifugal compressor. This unit was placed in the pipe line and the gas being pumped, passed through the motor and cooled it, and then passed through the compressor into the pipe line. This installation was entirely successful from the operating standpoint.



Two 50 h.p. motor-driven reciprocating pumps installed on a gathering system in East Texas

Control Equipment

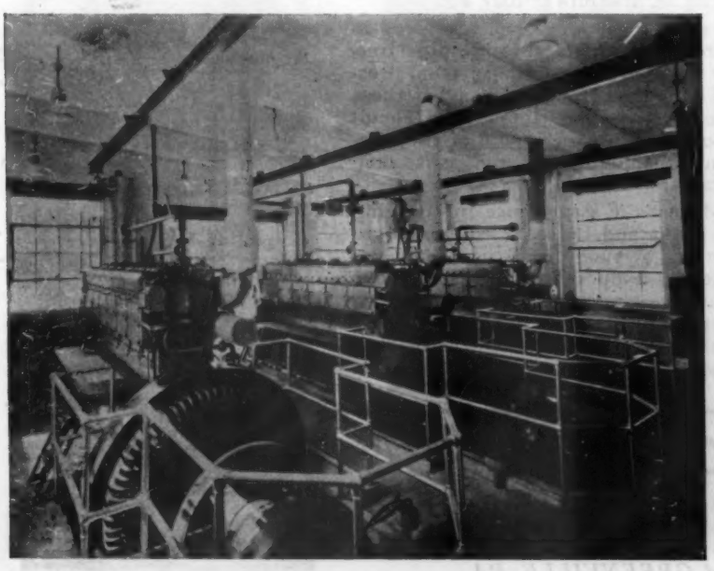
In the majority of installations standard control equipment is being used. Where squirrel cage motors are used, standard reduced voltage starting equipment of the manual or remote control type is most frequently used. This type of control provides overload protection and undervoltage protection to the motor.

Control equipment that provides time delay undervoltage protection has been widely used to material advantage. This type of protection prevents the shutdown of motors on voltage dips caused by switching on the power company system or by lightning. These dips are usually of short duration but if instantaneous undervoltage protection is afforded by the control equipment the motors will be shut down unnecessarily. The time delay undervoltage protective device keeps the motor connected to the electric service for approximately 1½ seconds after a power failure. If the power comes back on within 1½ seconds the motor will continue to run. Although there are very few power failures on power companies' systems, the majority of these are for periods of less than 1½ seconds, many unnecessary shutdowns are prevented by the use of this type of protection. It is needless to point out the desirability of this feature to pipe line operators.

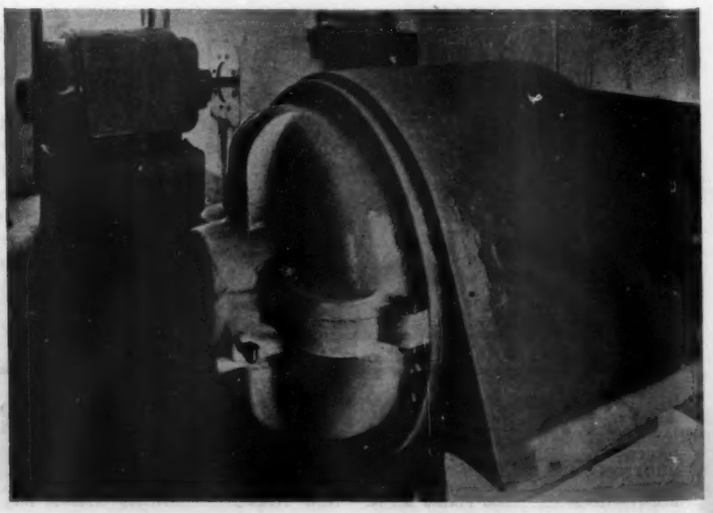
Control equipment used on slip ring motors has been of the manual type, frequently providing for speed reduction up to 25 per cent. In some cases speed reduction up to 50 per cent has been provided. Overload and undervoltage protection to the motor has also been provided.

Synchronous motors have been controlled by both remote control and manual control equipment. In these cases, overload and undervoltage protection has been afforded.

In some installations the pumps, mo-

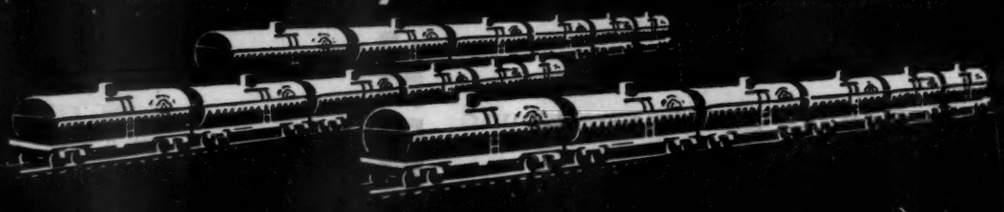


Engine generators in motor-driven centrifugal pump station

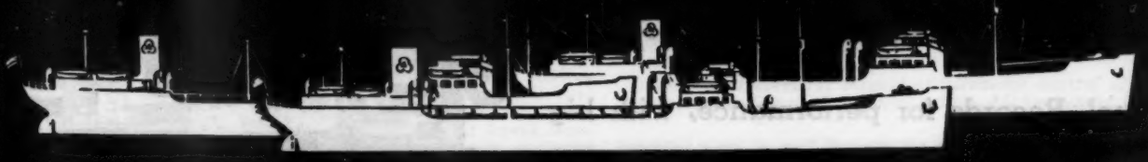


Two 350 h.p.—3600 r.p.m. motors driving centrifugal pumps through fire wall. Installed in engine generator type station

An army of tank cars



A navy of tankers



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Tulsa, Okla.

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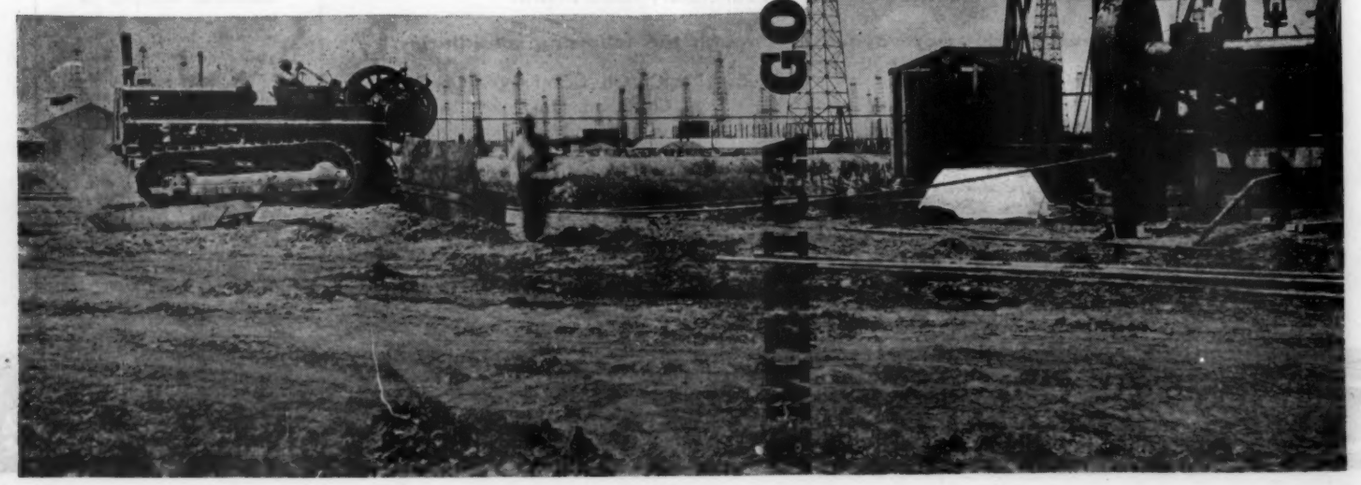


Four 125 h.p.—277 r.p.m. synchronous motors driving reciprocating pumps through fire wall in gasoline pipe line pump station

tors and control equipment have all been installed in the same room. Other companies have installed the pumps and motors in one room and the control equipment in a separate room. In still other cases the pumps have been installed in one room while the motors and control have been installed in another, with a fire wall between the pumps and motors.

It is obvious that the danger from explosion is the minimum when the pumps are installed in a separate room. However, as previously stated we know of no case where the cause of a fire in a pipe line station has been traced to the motors or control equipment.

Automatic Control

All of the above control equipment is so designed and constructed that certain automatic features can be applied thereto. It is relatively simple to use certain types of pressure switches and relays in conjunction with the above control so as to provide automatic shutdown of the pumps under certain emergency conditions such as high discharge pressure, loss of discharge pressure, loss of suction pressure, etc. Most of the present electric installations are provided with some emergency protection of this type.

Complete automatic control of booster stations using centrifugal pumps has been accomplished by line pressure conditions. This form of control is relatively inexpensive. Enough work has been done and enough knowledge gained from experience, however, to demonstrate that this type of control is practical. This is especially true if the station to be controlled automatically is preceded on the line by a centrifugal pump station. When the upstream station is a reciprocating pump station, the operating problem is somewhat more difficult but still the scheme is feasible.

Control of motor driven pumps from a remote point has also been tried and found to be successful. This requires a form of supervisory control that has been found very successful in other applications. The installations made on pipe line stations, while experimental, proved that the application is practical from the operating standpoint.

The practicability of the application of complete automatic control by line pressure or by supervisory control from a remote point depends largely on the economics of each pump station problem. Both forms of control are feasible and undoubtedly will be used in the future. The extent of the use will depend largely on the economics of each particular situation.

Automatic control of motor driven gathering pumps has also been extensively used. The control of such installations has been by fluid level in tanks, pressures and by time switches. In each case economical, convenient operation was afforded.

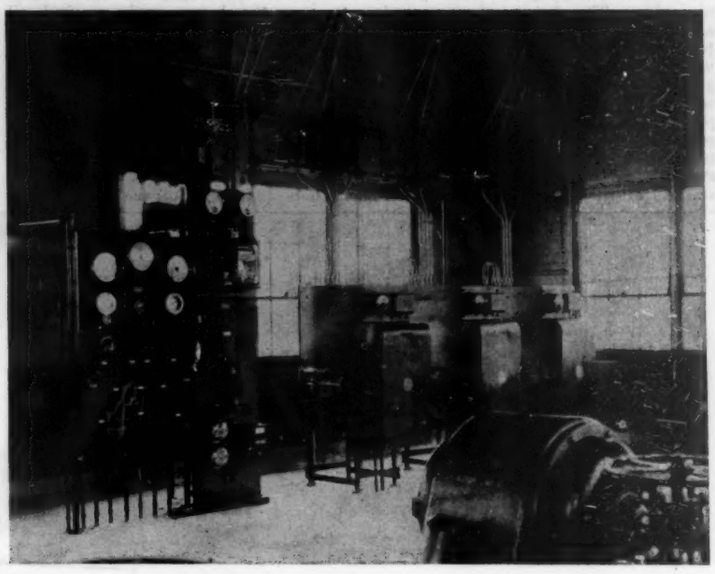
Engine Generators

While power companies have transmission systems covering the country, there have been a few station locations where electric service could not be obtained without the necessity for a considerable amount of transmission line construction. The expense of such construction coupled with the uncertainty of the length of time that electric service would be required at the station locations prevented the use of purchased electrical energy at these stations.

In many cases, however, pipe line operators who have used a large number of centrifugal pumps, realizing the advantages to be gained by their use, desired to use them even though purchased electric service was not available.

As indicated above, the centrifugal pump operating under pipe line conditions of volume and pressure is a high speed device, usually 3,600 r.p.m. On the other hand the Diesel engine which would naturally be considered by a pipe line company if purchased power were not available, is a relatively slow speed machine. Consequently some form of speed increaser must be used between the engine and the centrifugal pump.

Four 200 h.p.—450 r.p.m. slip ring induction motors driving plunger pumps through wall



Control equipment for manual or automatic control of three 250 h.p.—3600 r.p.m. motor-driven centrifugal pumps. All equipment installed in one room

In several cases operators who had used motor driven centrifugal pumps and who realized the advantages to be gained by electric operation, installed Diesel engine driven generators to furnish energy for driving motor driven centrifugal pumps. One station of this type has now been in operation for nearly two years and two additional stations have been in continuous operation for about 18 months. These stations have all operated successfully.

Conclusion

Pipe line companies have used motor driven pumps over a considerable period of time and are quite thoroughly acquainted with the advantages to be gained by their use. Efficient, reliable motor driven centrifugal pumps have been developed for handling large volumes of oil at high pressures. In certain sizes these pumps and motors are obtainable from warehouse stocks. In almost any size, shipment can be made in a very short time. Power companies and manufacturers of equipment for this service understand the problems and requirements of pipe line applications to a considerable extent. Under these conditions it is natural to expect a continued wide use of motor driven pumps in the pipe line industry.

California Company Starts Construction on Its 108-Mile 12-Inch Pipe Line

By L. P. STOCKMAN

LOS ANGELES, Calif., Oct. 22.—The Standard Oil Co. has just started construction on its new 12-inch welded pipe line from Rio Bravo station in Kern County, California, to tidewater at Estero Bay, a distance of 108 miles and if present plans materialize this installation should be in operation early in the spring of 1935. This crude oil pipe line will be electrically welded for its entire length and where necessary will have a protective coating to combat excessive corrosion. The Standard has two pipe lines which have their western termini at Estero Bay, the first having been laid about five years ago. The company's first installation was a crude oil line but this was supplemented shortly after by the laying of a natural gasoline line. Both of the projects start at Kettleman Hills.

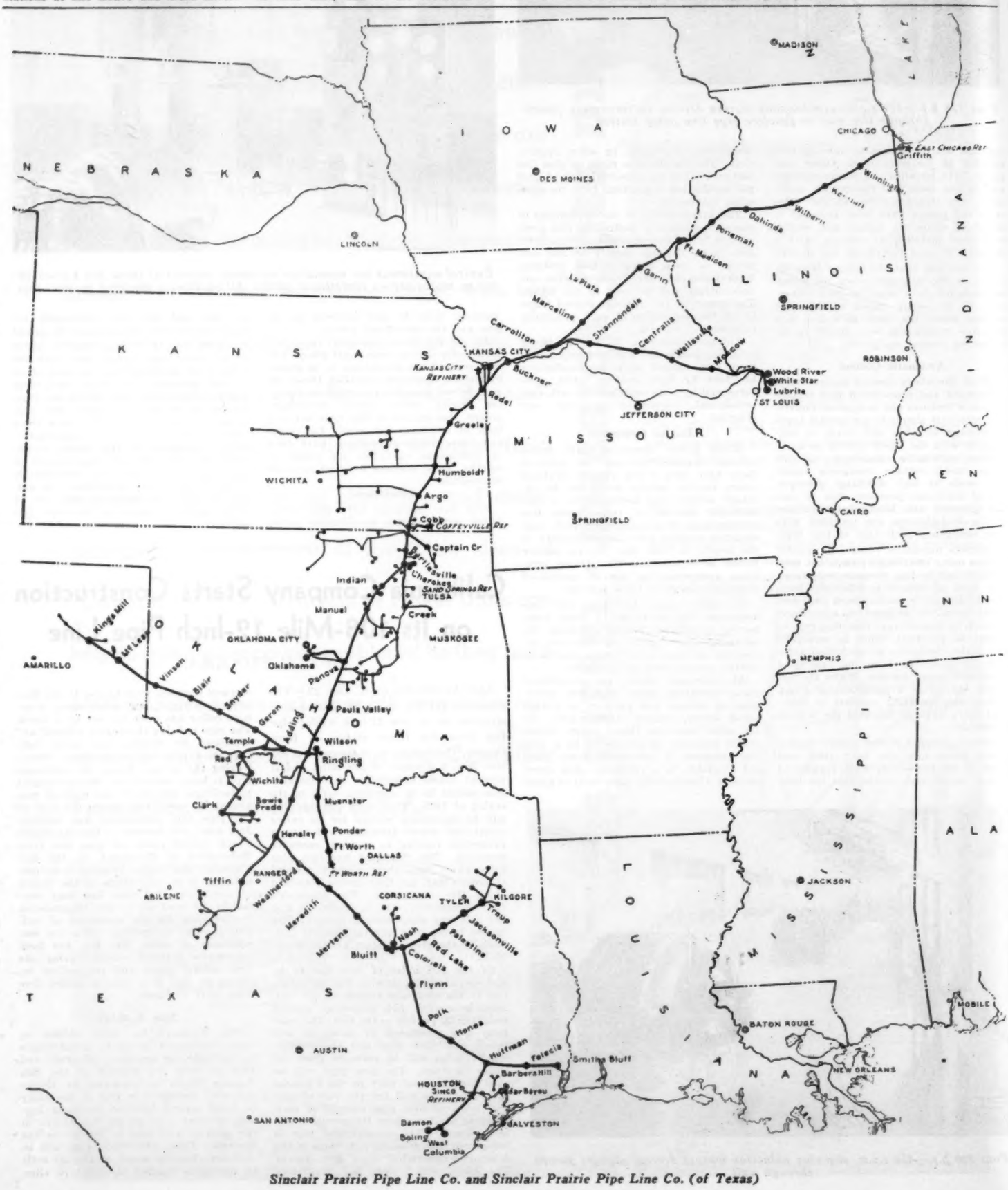
Of the 108 miles of new line to be laid specifications provide that 27 miles, due to the corrosive nature of the soil, must be coated with protective coating weighing 20 pounds to the foot. The company has purchased 17 miles of new seamless 12-inch pipe and the remaining 91 miles will be salvaged from existing facilities. The new pipe will be used for the most part in the Cholame area but plans call for the use of several miles of new pipe outside of each pumping station where the pressure will be greatest. This reconditioned pipe is being reclaimed from 12-inch loops in the Richmond-Bakersfield pipe line system. The loops, which were laid in 20-foot screwed sections, were hauled to the Kettleman salvage plant after every alternate collar has been cut out by a torch. The pipe is being thoroughly cleaned and reclaimed by welding any weak links that show pits due to corrosion. Before leaving the salvage depot, the reclaimed pipe is being welded into 40-foot lengths to facilitate delivery to the right of way and at the same time lessen the task of the pipe line contractors and welders. Just what will become of the Standard's 8-inch welded crude oil pipe line from Bakersfield to Richmond, in the San Francisco Bay region, remains to be seen although it is not outside of the realms of possibility that this line may ultimately be used as a gas transmission line or used for the movement of natural gasoline exclusively. This line was originally a screw line but has been practically entirely rebuilt during the past several years and the collars removed so that it is now a welded line from start to finish.

New Tankage

The Standard has been obliged to make additional adequate preparations to facilitate the movement of crude and fuel oil from the interior of the San Joaquin Basin to tidewater at Estero and will consequently find it necessary to build several hundred thousand barrels of steel tankage at Rio Bravo in the interior and also at Estero on the seacoast. These additional tanks will be necessary because much of the oil must be m ved in batches in order to elim-

inate the commingling of various grades of crude. The heavy viscous crude and fuel oil will require heating to approximately 180° especially during the winter months, whereas the lighter grades of crude can be moved at normal temperatures. The Standard is making preparations to construct five additional pumping stations along the route at intervals of approximately 18 miles apart and in addition will revamp the pumping stations at Rio Bravo and Kern River. At each unit, arrangements will be made to pass the heavy crude or fuel oil through heaters into which the exhaust steam from the pumps is discharged, thus taking advantage of the maximum amount of heat and pressure energy of the steam.

Approximately 900,000 bbls. of steel tankage will be erected by the Standard at Estero pump station and a like amount at Rio Bravo. It is interesting to note that, due to the elevation of storage tanks at Estero, which are about 700 feet above sea level, the Standard is enabled to load tankers by gravity flow. During the past several years, light oil has been loaded into tankers at the rate of approximately 15,000 bbls. per hour and it is believed that with proper heating the heavier grades of crude and fuel oil will gravitate at about the same rate. The Standard has found as a result of several years of successful operation that it is more economical to move crude oil to tidewater at Estero and from thence to its destination than it is to pump oil through its pipe line facilities to Richmond. This is particularly true in as much as Estero is midway between its Richmond refinery on San Francisco Bay and El Segundo refinery in Los Angeles Basin. In addition to the strategic location of Estero Bay, the Standard has a number of tankers which have for several years been working on part time.



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Views of Explosion Proof Generator installation through speed increaser

Many Variables Enter Proper Care and Operation of Diesel Engines

By a Representative of Humble Pipe Line Co.

In the care and operation of Diesel engines probably no hard and fast rules can be adopted, as the performance and maintenance of such equipment is a function of quite a few variables, among which are:

1. Quality of the fuel oil.
2. Circulating water supply and type of circulating system.
3. Proper selection of lubricating oil and method of reclaiming same.
4. Type of load enjoyed and running factor.
5. The efficiency of the station engineers with particular stress on the ability of the chief engineers.

Diesel engines are used quite extensively for pipe line pumping, and it is the writer's opinion that probably 75 per cent of all the pumping load is carried by Diesel equipment. There are many reasons why Diesel engines are used for pipe line transportation of oil or gasoline, chief among which are the following:

1. It operates on crude oil, a product of the petroleum industry.

2. Its economy when properly selected for the duties to be performed and properly installed and maintained cannot be questioned.

3. Only in a very few cases have the power companies been able to offer energy rates which will compare favorably with Diesel engine operation. This statement is undoubtedly truer today than 10 or 15 years ago, because of the fact that the oil industry, the federal and state regulatory bodies, as well as the general public recognize the need for an intelligent and sane program of oil production with the result that future expansion of the pipe line industry into new fields or the building of a trunk line system or connecting link would be based on a more definite program having a much longer outlook into the future than has existed in the past.

4. The type and size of engines in more general use by pipe line companies can be considered fairly portable. By this I mean they are fairly well adaptable for moving from place to place as the occasion demands, and the expense is not as great as we have been led to believe in the past.

5. Step-up gears are now available for driving high speed pumping equipment with Diesel engines. Such equipment can be installed for main line stations, field stations, or any general pumping condition which exists in the industry. Such equipment would also be desirable for loading oil aboard boats at terminals where large capacities at relatively low pressures are desired.

The above introductory remarks are more or less aside from the question at hand, but after giving considerable thought to the subject of this article it is the writer's opinion that a general discussion of the more common operating troubles and methods of mitigating same would probably be of more value to the average reader than any detailed setup of measures employed in maintaining and operating Diesel engines. I shall therefore endeavor to discuss some of the problems which are common to us all and determine, at least to a certain extent, the program of maintenance to be followed.

Fuel Oil

With the exception of the gasoline pipe line systems. Diesel engines employed for pipe line work use for fuel whatever grade of oil they pump through their lines, and any raw supply always contains certain impurities such as fine suspended sand, water, sulphur, hydrogen gases, and perhaps other lighter vapors which do not contribute to the efficiency of the fuel. Impurities such as the presence of hydrogen sulphide and water in fuel contribute greatly towards the maintenance of exhaust valves, fuel pump plungers, atomizers, outside fuel gravity lines, piston rings, liner wear, bearings, and under certain conditions can even cause severe pitting of crank shafts.

"C" station Humble Pipe Line Co., Bandera County

Some too or three years ago we made a check of liner wear at various main line stations, comparing the wear on engines which used West Texas crude for fuel and which contained considerable free sulphur and hydrogen sulphide with similar equipment using sweet crude for fuel at other locations on the system. At that time we found the liner wear to be two or three times as great with the West Texas fuel as with the sweet crude or Coastal crude fuel. These troubles can be minimized to a certain extent by either centrifuging the fuel or installing twin fuel tanks which will permit the settling of the fuel over an appreciable period of time. On a test which we conducted we found that one week's settling would remove approximately 65 per cent of the water, b.s. and other foreign matter which would ordinarily be removed by the centrifuge equipment. However, the centrifuge equipment seemed to remove the greatest part of the hydrogen sulphide gas, whereas by the settling method this hydrogen sulphide gas would probably not be weathered off to the same extent that it would be by the centrifuge method.

It is rather problematical as to how much damage the 35 per cent which remained in the crude by the settling method would contribute towards troubles which can be attributed directly to fuel oil. For a period of approximately one year we kept a set of records at one station using the centrifuge method of oil purification and made direct comparison to a group of other stations using sour crude for fuel, having a twin fuel tank installation which permitted the settling of same before use. These figures revealed that the maintenance expense and liner and bearing wear measurements were not entirely conclusive, and it appeared that we were able to obtain at some of the stations equally as satisfactory results with the twin fuel tank arrangement as we were obtaining with the centrifuge method. Here again, however, we found that probably the efficiency of the operating personnel had quite an appreciable bearing on the actual results obtained.

Centrifuge Equipment

On the whole, there is little doubt but what a better condition of fuel would be obtained by employing the use of the centrifuge equipment rather than long time gravity settling method. The only disadvantage which we might point out in the centrifuge method would be the lack of attention on the part of the operating engineers to properly clean and maintain their centrifuging apparatus, as we have demonstrated time and again that oil cannot be satisfactorily cleaned by the centrifuge method when the bowl of the machine is permitted to become thoroughly loaded with impurities and kept in operation in such condition.

Some crude oils contain considerable finely divided sand which is held in

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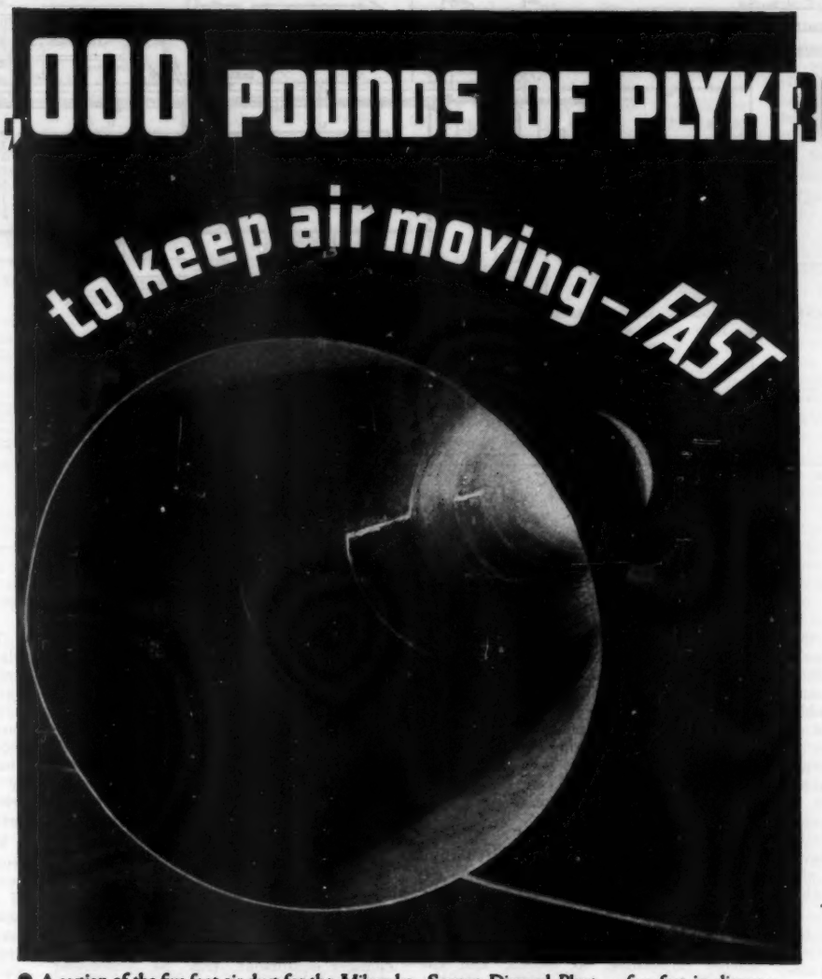

● A section of the five-foot air duct for the Milwaukee Sewage Disposal Plant... five feet in diameter... with a total length of 1800 feet. One-quarter inch Plykrome is the material.

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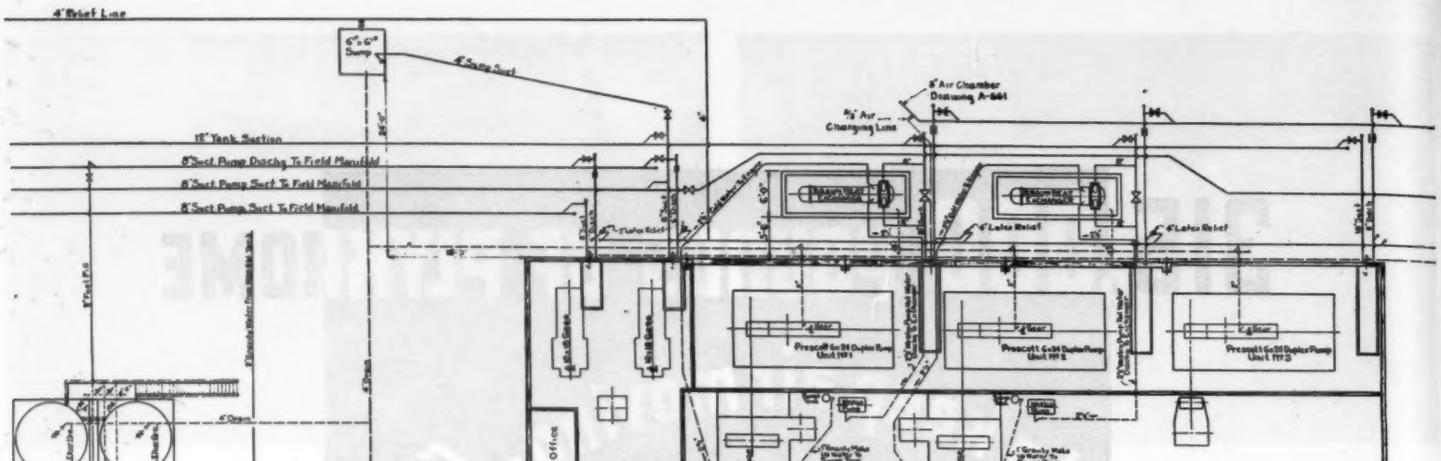

4" Brief Line
6"-6" Sump
4" Sump Suct.
12" Tank Suction
8" Suct. Pump Discha. To Field Manifold
8" Suct. Pump Suct. To Field Manifold
8" Suct. Pump Suct. To Field Manifold
8" Air Chamber Drawing A-641
5" Air Charging Line
4" Lake Relief
4" Lake Relief
4" Lake Relief
Office
2-125 Bbl Fuel Tanks Drwg. E-852-M

Operating piping layout Yates Pecos station

suspension, and we have found that considerable wear and consequent maintenance is required to fuel pump plungers, check valves, etc., where such crude is used for fuel. These troubles can be minimized to a certain extent by gravity settling, employing the use of two fuel tanks, or by the centrifuge method. However, it is doubtful whether the savings in maintenance expense to the engine on this account alone would entirely warrant the complete installation of a centrifuge system for large main line stations unless the oil also contained hydrogen sulphide or other damaging impurities.

Sediment traps can be located in the fuel supply line to the engines, which, together with the fuel filters or strainers, will remove a considerable portion of the suspended matter.

Liner and piston ring wear can be minimized to a certain extent by the installation of approved air cleaning apparatus on the intake line to both the cylinders and the air compressors. There are several types of this equipment on the market. One employs the use of a filtering medium which requires frequent washing and dipping in light body lubricating oil such as crank case drainage. Another is composed of a cell or series of cells of felt or fabric material which requires very little attention. This particular type of cleaner can be cleaned by back blowing.

There is another type of cleaner on the market which appears to render satisfactory service. It carries a supply of light body oil in the bottom or base of the apparatus and as the intake air is drawn into the engine this oil is lifted and splashed against a filtering medium. Therefore, the filtering medium should be wetted at all times, thereby definitely assuring the removal of dust, sand or other foreign matter.

Manufacturers also build several types of continuous air cleaners which definitely assure the filtering medium being moistened with oil at all times. This sort of apparatus usually calls for considerable expense in running the several intake lines to a central unit, but there can be no question as to the superiority of this type of installation.

Many pipe line stations are located at places where the atmosphere is always more or less loaded with dust and sand particles, and an inspection of one of our units in West Texas after about a year's operation showed accumulation of approximately one shovel full of sand in the intake manifold of the engine. On this particular engine we had installed a make-shift air cleaning apparatus which appeared to possess some merit, but the inspection revealed that we would very likely have been as well off to have installed an open intake line directly to the atmosphere.

Circulating Water

An adequate supply of soft circulating water for jacket water cooling is the exception rather than the rule. Pipe line stations are in many cases located in isolated parts of the country where an adequate supply of water is difficult, if not almost impossible, to obtain, and the quality of the water is usually such that some sort of treatment is required. In past years the practice has always been to use whatever supply of water was at hand, either installing a treating plant for removing the scale-forming salts, or maintaining circulating water temperatures so low that there would be only a small amount of accumulation of scale in the jackets or heads of the engines.

Such a system will invariably call for a frequent and costly removal of scale by using acids and almost invariably sufficient scale accumulates in the head of the engine to cause breakage. During the past few years closed circulating water systems have come into prominence by one of the following methods:

1. The use of closed exchangers, usually of the removable tube bundle type employing the use of raw water through the tubes and soft water in the shell of the exchanger.

2. The use of the same sort of apparatus except employing the use of the crude oil stream as a cooling medium for the jacket water.

The former method requires an adequate source of supply for the raw water inasmuch as a cooling tower must be employed to reduce the temperature of the raw water before circulating through the exchangers.

The latter method has now been tried and proven and practically all installations which have been made in the past two or three years have employed the principle of using either the suction line stream, the incoming stream, or the discharge stream as a cooling medium for jacket water.

The average four-cycle Diesel engine ly 30 per cent. By that I mean approxhas a thermal efficiency of approximateimately 30 per cent of the heat value of the fuel is converted into useful work, the other 70 per cent being rejected in the exhaust gases, carried away through the jacket water, and approximately 7 per cent lost through radiation and conduction. For all practical purposes it can be assumed that it will be necessary to carry off through the jacket water approximately 33⅓ per cent of the total fuel heat, and by limiting the temperature of the outlet from jackets to a maximum of around 140° F. with an assumed maximum temperature of the oil stream as a cooling medium of around 90° F., very satisfactory exchanger equipment can be purchased from several manufacturers.

Heat Exchanger Equipment

The matter of proper selection of exchanger equipment for jacket water cooler purposes must be based on several different factors, among which are the minimum and maximum temperatures desired for both summer and winter time conditions, and in order for the manufacturer to work out the proper design to fit in best with the particular installation at hand he must also know the characteristics of the oil that is, the gravity and the viscosity at maximum and minimum conditions, and an estimate of total heat to be removed.

For most of the larger main line stations where large volumes of oil are handled, it has been considered more practical to install closed water exchangers on the suction side of the pumps. However, there is no question but what greater efficiency of the equipment could be obtained were it permissible to install same on the discharge side of the pump, as a discharge installation would permit greater drop on the oil side of the exchanger, thereby providing greater turbulence and a better heat transfer rate.

Our investigation of the cost of discharge exchangers has revealed that there is no saving to be had in investment. Therefore, for the larger installations, most companies have preferred the low pressure type of equipment. As a matter of rceord, accompanying this article is a print of a typical closed water system which will give the reader an idea of the installations which are in general use in the Mid-Continent Field.

The matter of satisfactory water supply for small gathering stations which are often located at isolated points in various oil fields has been a very difficult problem, and in recent years numerous installations have been made, using a small closed exchanger on the discharge side of the pumps, which usually require approximately 25 pounds friction drop on the oil side, and very satisfactory results have been obtained.

For the larger Diesel engines—that is, from 60 horsepower on up—it has been our practice to specify the circulation of approximately 25 gallons per horsepower per hour, with a minimum temperature drop in the jacket water of 140° F. to 130° F. We are, perhaps, a little conservative in our requirements, as we find that usually temperatures will not run quite this high.

We have found also from experience that while it is desirable to have soft water circulating through the water jackets, it is not absolutely necessary on a closed system, inasmuch as the average closed installation does not require the circulation of more than 1½ to 2 bbls. of water per 100 rated horsepower, and the losses from the closed system that is properly installed are so slight that a small amount of additional make-up water would require several years to furnish sufficient scale accumulation to cause any serious trouble within the jackets or heads of the engine.

The estimated cost of a closed circulating system along the lines described above, complete with the necessary circulating pumps, surge tanks, piping connections, etc., will probably not exceed one-half the cost of the installation of open system employing the use of either concrete reservoirs having surface cooling, or the installation of smaller reservoirs using atmospheric cooling towers such as are used to a large extent.

Considering the advantages to be gained by avoiding the expense of securing an adequate source of water supply and the attendant corrosion and scale troubles as well as the necessary occasional boiling out of jackets and heads, there can be no question but what the closed system is the only one to be given any serious consideration today.

Lubrication

The proper lubrication of Diesel engine cylinders is somewhat difficult, es-

pecially so since relatively high temperatures are encountered in the combustion chamber. It has been stated by authorities that the temperatures in the combustion chambers of four-cycle Diesel engines vary anywhere from 250° F. to as high as 2,700° F. While it is true that the temperatures encountered are rather high, on the other hand the time of exposure of the oil film on the cylinder wall to these high temperatures is relatively short, being only one-fifth to one-third of a second duration on the average Diesel employed by pipe line companies. Therefore, one must select for cylinder lubrication an oil having a fairly high flashpoint and of sufficient viscosity to provide an oil film at high temperatures. On the other hand, one must guard against the selection of an oil which has too much body or is too heavy, since it will cause sticking of piston rings, which will inevitably result in blow-by of the exhaust gases with the resultant contamination of the crankcase oil.

Some engines do not employ the use of force-feed lubrication to the cylinders, and on those that do have force-feed lubrication our investigation has revealed that sticking piston rings can be attributed almost solely to excess lubrication. The matter of the proper amount of lubrication and the proper grade to be used is one that can be more accurately determined by tests.

Practically all Diesel engines depend in part for cylinder lubrication on the splash from the crankpin bearings and the mist which is present in the crankcase during operation. In general, it can probably be said that the oil selected should have the following qualities:

1. It should have sufficient body to provide an oil film on the bearing surfaces at the temperatures encountered.

2. It should be an oil that does not emulsify readily.

3. Some consideration should be given to the reclamation qualities of the oil, as it has been found from past experience that some oils do not seem to separate readily from foreign matter and water globules, even in the modern type of centrifuge machine.

Air Compressors

Next to cylinder lubrication, the lubrication of the air compressors on air injection engines probably presents the greatest difficulties. The temperatures encountered in the compression chambers are not as high as those in the power cylinders. However, there is always present in the intake air small particles of condensed moisture, which has a washing effect on the cylinder walls and tends to destroy lubrication, causing a loss of seal between the piston rings and cylinder walls. An oil for air compressor lubrication should be one that does not readily form carbon deposits on the heads, valves and air passages of the compressor, as under proper conditions these deposits have been known to cause serious explosions.

It is also important that the air compressor be supplied with the proper grade and amount of lubricating oil since there is a possibility of blow-by from the crankcase of the engine, which, in the event sour crude is used for fuel, causes an accumulation of carbon and perhaps sulphur dioxide on the tubes of the intercoolers. By nature this substance is highly corrosive and readily attacks the tube walls, thereby creating an explosion hazard on the intercoolers. In the past, most of the engine manufacturers have recommended the use of compounded oils for air compressor lubrication. However, our experience over the past few years has about convinced us that we can use the same grade of lubricant on air compressors on which we have practically standardized for power cylinder lubrication, which oil is not a compounded oil.

Lub Oil Purification

All Diesel engine stations should be provided with satisfactory lub oil purification systems and there are three general methods in use.

1. The gravity settling method.

2. The use of centrifuge machines on either the batch or continuous method.

3. The use of re-refining apparatus.

The use of any system for reclaiming lubricating oils should remove from the oil all of the impurities which are detrimental to the satisfactory lubrication of the bearings and wearing surfaces. It is impossible to remove all of the impurities by the gravity settling method unless a system could be worked out whereby a large tank could be employed which could be permitted to stand for a considerable period of time and at the same time receive sufficient heat for aiding in the settling as well as removing the water, small particles of which are bound to accumulate in the crankcase or sump tank of any engine.

On the whole, the gravity settling method would be considered impractical.

All pipe line companies are probably agreed that the most practical method of reclaiming lub oil is by the centrifuge method and this can be done without using a great deal of the operating engineer's time except for properly cleaning the bowl of the machine at regular intervals. Probably the most satisfactory method of reclaiming engine lub oil would be by the batch method, provided the machine could be taken out of service and completely emptied of all of the old oil before refilling with either new oil or first class reclaimed oil. This scheme is not in general practice, as it is impractical to shut down a unit for making the changeout at the proper time, and it has also been found that the operating engineers are prone to permit an engine to run entirely too long before making a changeout by this method. Therefore, the more accepted practice today is the use of a continuous system which permits the removal of oil from the engine during operation, preferably from the bottom of the rest tank, or, in case of the absence of the rest tank, from the bottom of the filter or crankcase, and a direct return at the same time of clean oil to the system at or near the suction of the lub oil pump, which is generally built into the engine.

This scheme permits the almost continuous removal of carbon and other foreign matter from the oil, whereas the batch method will permit the formation and accumulation of carbon on the under side of the piston heads and baffle plates and large amounts are generally removed whenever a crankcase is gone into for a general overhauling or cleaning.

It is a simple matter to install small waste heat boilers on the exhaust lines of engines for providing steam which is necessary to properly reclaim the oil. We have found from experience that a temperature of 175° to 180° F. is desirable in reclaiming oil by the centrifuge method, either the batch or the continuous system.

There are several types of re-refining equipment on the market, but they are all considered more or less inapplicable to the average pipe line station. However, they may have their proper place in the reclaiming of automobile crankcase oils at large central garages where there is a considerable accumulation of used oils. In general this sort of apparatus requires too much attention, and to be thoroughly satisfactory probably requires the use of a centrifuge in connection therewith. Most all of these systems also require the use of some chemical for facilitating the settling and practically all of them require considerable heat for dehydrating after the oil has been washed and run through the apparatus.

Most of the manufacturers of centrifuge equipment are now building units complete with twin pumps so that arrangements can be made to take direct suction from any unit, delivering same to the reclaimer, and the other pump either delivers directly back to the unit or into another tank, as the occasion demands.

Miscellaneous

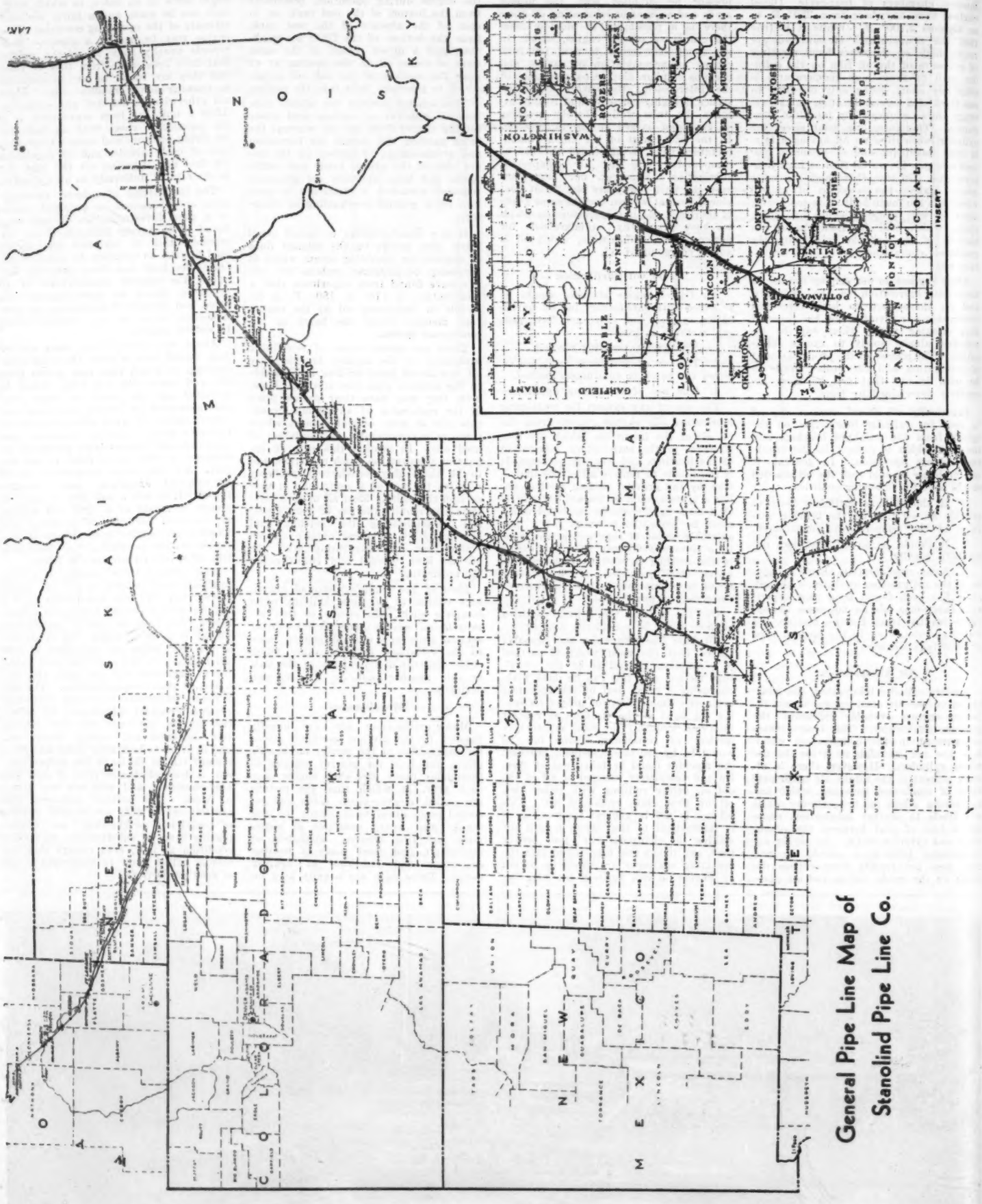
Major overhauling jobs are usually handled by the division mechanic under the supervision of the master mechanic's office, and it is the general practice to thoroughly check over each engine once each year, at which time the pistons are pulled, measurements made and recorded as to linear wear, piston pin and crank pin wear, condition of piston rings and ring grooves, alignment of crankshaft, and check made of bearing clearances and condition of bearing metal. These data are usually kept on Kardex form or in a ledger at both the station and in the master mechanic's office, along with the hours operated or any other pertinent information which might serve as an index, to which reference can be made and a fairly accurate estimate of the operating condition of an engine may be had at a glance. Such records usually show all of the repairs that have been made from time to time, and they are found to be indispensable in running down troubles that might not otherwise be detected and corrected. After a unit has been overhauled, it is the practice to check with an indicator the firing pressure and compression pressure of each cylinder and by regulating the fuel and injection air the load can be distributed uniformly to all cylinders.

The installation of exhaust thermometers or pyrometers on a Diesel engine is a good investment, as it has been found to be a very difficult, if not impossible, task to maintain the proper load balance on cylinders by sound alone. Once the load has been properly balanced, the exhaust temperatures of all cylinders should be approximately the same, and the use of pyrometers or thermometers serves as an excellent index to needed repairs.

About once every five years an engine should have a more thorough overhauling, at which time new piston pins, pin and connecting rod bolts should be installed, and the crank and main journals measured for uneven wear, and corrective measures taken where warranted. Cylinder heads, jackets, crankcase and frame should be thoroughly examined for evidence of cracking or flaws of any nature. Air compressor intercoolers should be removed, examined, and pressure tested. It is not a bad idea to also examine by means of a light and mirror, the internal condition of injection and starting air bottles, even though it is a rather remote possibility that deterioration of serious nature may be found.

The modern Diesel engine is a very practical and reliable type of prime mover, but like the automobile it will require some attention and minor adjustments from time to time if satisfactory service is to be obtained. No doubt one of the most important requisites to good performance is the selection and training of engineers who are alert and conscious of their responsibilities. The satisfactory performance of such equipment requires frequent adjustment of valves, fuel pumps, governor bearings, lubrication, injection air, cooling water, etc., and in order to look after these and other regular station duties in the proper manner, it demands the services of men who are competent and who are not afraid of work. The station engineers who are on regular duty are usually capable of completely overhauling an engine, placing same in substantially as good a condition as new, even though they are seldom called upon to undertake a job of such proportions.

No evidence of drought in construction of this pipe line



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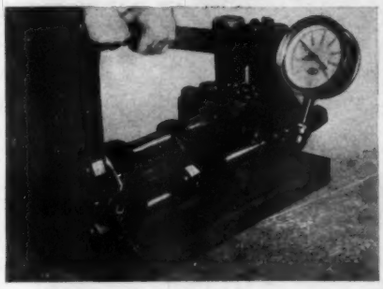

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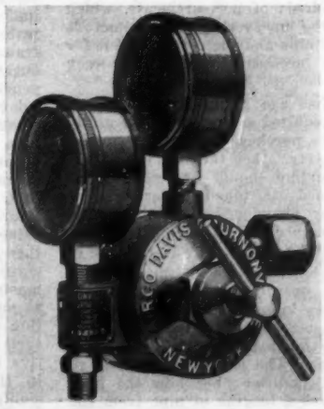

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Application of a Few Statistical Principles to Corrosion Problems

By GORDON N. SCOTT
U. S. Bureau of Standards*

ABSTRACT

There is a definite need in the industry for a method for quantitatively describing the condition of a pipe line. As a basis for such a system certain statistical principles appear well suited. The application of these principles has been illustrated by actual pit depth measurements taken from pipe lines.

The variation in means of small samples has been discussed in detail with especial emphasis on the number of samples required for a given accuracy of the mean. Tchebycheff's theorem has been employed to predict from small samples the number of lengths of pipe in a system falling outside certain values of pit depths. While we cannot predict with accuracy the exact number of pipe lengths having pit depths greater than an assigned value, we can definitely determine that the value of such lengths is not greater than a certain value.

For a problem of such vast importance as soil corrosion there is a great lack of reliable, quantitative information on the condition of pipe. To overcome this situation it is proposed that the industry foster in a co-operative spirit the collection of quantitative data. The immediate benefits which would be derived by those entering into the program have been pointed out.

The system which is proposed is conservative and eminently practical. It may be employed in the sale or purchase of pipe, in budgeting reconditioning costs, and in the accumulation of data for valuation purposes.

1. INTRODUCTION

In preparation for certain litigation between a city and a gas company it was necessary to determine the condition of the gas company's transmission and distribution system. It was agreed that pit depths would constitute the measure of the pipe's condition. The average or mean pit depth for a particular system divided by the wall thickness of the pipe was taken as the "percentage condition of the pipe." Thus, if a number of measurements on an 8-inch line having a wall thickness of 322 mils (0.322 in.) averaged 161 mils, the system was said to be in 50 per cent condition. That the time element or rate of depreciation of the pipe was ignored was in this case of little consequence since the judgment on the condition of the pipe was a matter of agreement. But of great importance was the question of how accurately the mean was known, since a variation of a few per cent in the mean would affect the value of the pipe system by many thousands of dollars. But this question of accuracy was not investigated. Were the many hundreds of measurements, which required the uncovering of numerous sections of pipe and the cleaning of it for inspection, necessary for the accuracy desired?

Some time ago a pipe line executive, who had acquired a pipe line incidentally through the purchase by his company of other property, asked the author whether or not the line should be reconditioned for continued use, taken up for recovery of pipe, or abandoned. There was no tangible engineering evidence of the condition of the line, but it was reputed to be in a "very bad" state of repair.

Another operator inquired, with reference to an intended sale of a pipe line which for his company had outrun its usefulness, what price should be asked for the pipe. The pipe line was said to be in fair condition; but how the individually racked lengths of pipe from the dismantled line would be distributed into good, bad, fair, indifferent, junk or into any other descriptive classification could in no way be determined from the knowledge that the line was in fair operating condition.

"Good, Fair or Bad" Pipe Lines

Questions similar to these have often come to the author's attention and have quickened his interest in the problem. To engineers familiar with the operation of pipe lines such vague terms as good, fair and bad undoubtedly convey a general notion as to the condition of the pipe in a system. Thus good would indicate that fluid (oil, gasoline, gas or water as the case might be) could be transported by means of the line without serious loss of goods, time, or expenditures for repairs. But it is doubtful if two operators would agree as to what constituted a fair condition of a pipe line. If our knowledge of the condition of pipe or a pipe line is to be extended beyond a qualitative description, obviously another kind of information, namely, quantitative, must be gained. It is the purpose of this paper, therefore to point out how a few simple statistical principles, which are easily mastered, may be employed to extract as much as possible of the total information within a group of data. Obviously, such a purpose would fail in its objective if it did not prove at least helpful in the solution of corrosion problems similar to those which constitute the introduction to this paper.

In the following pages many references are made to two publications which contain all of the essential information for the development of the subject matter of this paper. The 1933 A.S.T.M. Manual on Presentation of Data defines the simple statistical functions and points out their significance and use. Economic Control of Quality of Manufactured Product (D. Van Nostrand Co., New York, 1931) by W. A. Shewhart, is a more extended discussion of the practical application of statistics and is referred to in some matters beyond the scope of the A.S.T.M. Manual.

*Publication authorized by the Director of the Bureau of Standards of the U. S. Department of Commerce.

Showing the extreme variation in corrosion which may occur in relatively short intervals

2. Distribution of Pit Depths

In some engineering work we are accustomed to a high degree of precision in measurement. Thus two surveys of a mile result in negligible difference in the setting of the final stake. But in soil corrosion we are immediately struck with the wide difference in value between individual measurements even if the corrosion has been allowed to develop and measured under what might be considered identical conditions. The ordinary measure of corrosion is the depth of the deepest pit found on a given exposed area, for example, the deepest pit on a 20-foot length of 8-inch pipe.

Any group of measurements is defined as a sample. The number n of measurements in a group is referred to as the sample size. In pipe line work, it is not possible to gather more than a limited number of measurements. Indeed, it would not be profitable in practice to make every possible measurement unless the pipe line was being dismantled.

An inspection of an ordered group of soil corrosion data shows a certain regularity. Although any two measurements may differ widely, the mass of data tends to center around some particular value. The average or mean, P, of all the measurements is the most widely used measure of this central tendency. The individual measurements are said to be distributed. The totality of measurements constitutes a distribution. The mean is a function of the distribution.

The mean in itself really gives no information regarding the distribution of the pit depths in the sample. In some localities corrosion is relatively uniform whereas in others it varies widely from place to place along the right-of-way. Figure 1 shows three 3-inch control specimens, 2 feet long, in the A.P.I. pipe coating tests[1,2] which were not separated in the soil by more than 30 feet. Holes had developed in one specimen, but there were no measurable pits on the others. The wall thickness of the specimens is 215 mils.

In the A.P.I. tests two sets of the 1934 pit depth measurements on 3-inch specimens taken from different localities (Sites 6 and 12) yield about the same mean. The corrosion at Site 6 is relatively uniform, but the corrosion at Site 12 is very erratic as illustrated in Figure 1. In Table I a comparison is shown between the two sets of data.

TABLE 1—COMPARISON BETWEEN TWO SAMPLES OF SAME MEAN DIFFERING WIDELY IN SPREAD

Site	Size of sample, n	Mean P	Maximum	Minimum	Range	Standard deviation, σ
6	26	46.46	63	31	37	10.6
12	26	45.92	216+	2	214+	60.8

In Column 1 of Table 1 the site or source of data is indicated. In the second column the size of the sample is included, and in the third column the mean of the groups of the 26 measurements are shown. In the fourth and fifth columns are given the pits of greatest and least depth in the sample. The + sign following the figure 216 (the wall thickness of the pipe) indicates that a hole had developed in the pipe. The difference between the maximum and minimum depths is the range, shown in Column 6. The range is a measure of the dispersion or spread in the data and serves to differentiate between the

[1]Scott, Proc. A.P.I. 12 (4) 72 (1931).
[2]Scott, Proc. A.P.I. 13 (4) 123 (1932).

two unlike distributions. The standard deviation, represented by sigma[2] (σ), is a more efficient measure of dispersion than the range and is given in Column 7. The range takes account only of the extreme values, which may differ from sample to sample of like materials, while the standard deviation is calculated from all of the measurements and is more uniform where calculated from samples of like materials.

It is evident from the figures in Table 1 that the two distributions from which the samples of size, n=26 were drawn, although having very nearly the same mean, differ markedly in a fundamental respect, namely, the dispersion of the data. This difference is indicated by the range and, more efficiently, by the standard deviation.

Before we proceed to the discussion of our particular problems, some consideration of distributions in general and of pit depths in particular will prove of value. Although in practice distributions vary widely in functional form, there is one recurring distribution to which considerable study has been given. This distribution conforms to the so-called Normal Law yielding the familiar bell-shaped distribution curve, symmetrical on either side of the mean. The mean is coincident with the highest point of the curve or point of maximum frequency.

All of the distribution curves derived from pit depth measurements which have come to the author's attention have a general similarity to the normal distribution curve but are characterized by a distortion or positive skewness[4]. The range of values greater than the mean always exceeds the range of values less than the mean. A glance at Table 1 will illustrate the point. If the distribution were normal, the prediction of the number of measurements within any stated interval could be made with great precision. However, such is not the case and a normal distribution of pit depths is not to be expected in pipe line corrosion.

3. Distribution of Means, Small Samples

With these preliminary explanations in mind, we may examine how accurately a mean can be determined. In the hypothetical distribution, composed of an infinity of individual values, the mean has a definite value. A pipe line is a finite system capable of yielding a fixed number of measurements if the rule for taking the maximum pit depth is confined to a practical area, such as a running foot of pipe or a 20-foot length. The totality of measurements, considered a large sample of the hypothetical distribution, would give the most accurate possible value of the mean of the distribution. In practice we desire to know this latter mean, but to determine it exactly would in most cases require an undue expenditure of time and money. By taking a smaller number of measurements, a sample of size n, at regular intervals, we may approximate the mean with sufficient accuracy for all practical purposes. The size of sample to take, i.e., the number of pit depths to measure, will depend upon how accurately we desire to approximate the mean. Our choice of accuracy may be largely influenced by the cost of obtaining the data.

Just as the array of individual measurements constitute a distribution, so do the means of a number of small samples of size n. The means of small samples drawn from the array of individuals vary about the objective mean with a standard deviation, σ_P, of their own. Although, as pointed out, the distribution of the individuals will most likely be skew, the distribution of means of small samples approaches normality. According to Shewhart[5], even for comparatively small values of n, the distribution of averages may be considered to be normal to a high degree of approximation. This fact equips us with a very powerful tool since for averages we can make use of the Normal Law.

The standard deviation of the means, σ_P, is simply related[6] to the standard deviation of the individuals, σ.

$$\sigma_P = \frac{\sigma}{\sqrt{n}} \qquad (1)$$

In words, this equation states that the standard deviation of the means is equal to the standard deviation of the individual measurements, divided by the square root of the sample size.

In Table 2 are presented 64 means, of 32 measurements each, calculated from a total of 2,048 measurements made by Weidner and Davis[7] The means are arranged in order of increasing magnitude from top to bottom and from left to right. The mean, P, of the 2,048 measurements is 39.25 mils and the standard deviation, σ, of the individual measurements is 25.83 mils.

TABLE 2—FREQUENCY DISTRIBUTION OF MEANS (IN MILS) OF SAMPLES OF SIZE 32

28.59	36.56	39.22	42.34
28.59	36.72	39.22	42.66
31.72	36.72	39.37	42.81
31.88	36.88	39.38	43.75
32.19	37.03	39.69	43.75
32.41	37.50	39.69	43.75
33.44	37.50	40.31	43.91
33.91	37.81	40.31	43.91
34.06	38.13	40.31	44.38
34.22	39.13	41.56	44.38
35.16	38.13	41.56	44.38
35.16	38.28	41.88	46.00
35.16	38.44	42.19	46.25
35.47	38.59	42.19	46.41
35.63	38.75	42.19	46.56
36.41	39.06	42.34	57.97

The standard deviation, σ_P, has not been calculated from the 64 means in Table 2, but it can be accurately obtained from Equation 1. Thus,

$$\sigma_P = \frac{25.83}{\sqrt{32}} = 4.57$$

Since, as explained, the Normal Law holds for the distribution of means, we may calculate very accurately how many measurements fall within any closed range desired, and defined by the limits

$$P \pm t\sigma_P$$

where t is an optional number, the significance of which is made clear in the following paragraphs.

In Table 3 are presented the results of a few such calculations. In Column 1 are arbitrary values of t defining, together with P and σ_P, the limits of closed ranges. The normal law probabilities[8] associated with the values of t are given in Column 2. The closed ranges corresponding to the values of t are given in Column 3 and the calculated number of means which should fall within these ranges if the distribution is normal are listed in Column 4. The actual numbers falling in the several ranges as counted in table 2 are shown in Column 5. The calculations are made as follows: for a value of $t = 1$ the limits of the closed range are $39.25 \pm 1 \times 4.57 = 34.68$ and 43.82. The probability associated with this value of t is read from the tables of the Normal Law probability integral to be 0.6827. That is, 68.27 per cent of 64 or 43.7 of the values in Table 2 should fall within the closed range corresponding to $t = 1$. The agreement of theory with experiment in Table 3 is striking.

TABLE 3—THEORETICAL AND ACTUAL NUMBER OF MEANS FALLING WITHIN CERTAIN CLOSED RANGES

(P = 39.25, σ_P = 4.57)

t	Probability, P for normal distribution	Closed range Min.	Closed range Max.	No. of means in range: From Th'ry	From Table 2
0.6745	0.5000	36.17	to 42.33	32	32
1	.6827	34.68	to 43.82	44	44
2	.9545	30.11	to 48.39	61	61
3	.9973	25.73	to 52.96	63.8	63

[2]The standard deviation of a set of n pit depths, P_1, P_2, P_3 . . . P_n may be calculated by the equation

$$\sigma = \sqrt{\frac{P_1^2 + P_2^2 + \ldots + P_n^2}{n} - p^2}$$

where P is the average or mean of the n pit depths. See A.S.T.M. Manual, p. 16.

[4]See A.S.T.M. Manual, p. 14

[5]See Shewhart, page 182.

[6]Shewhart, page 180.

[7]Weidner and Davis, Proc. A.P.I., 12 (IV) 36 (1931).

[8]Shewhart, page 94.

TABLE 4—DISPERSION COEFFICIENTS OF A FEW DISTRIBUTIONS FROM PIPE LINE CORROSION MEASUREMENTS

Line—	Size of sample (n)	Mean (P)	Standard deviation (σ)	Dispersion coefficient (v)
1	2,048	39.3	25.8	65.7
2	1,024	27.6	16.0	58.0
3	272	130.4	51.5	38.4
4	992	21.8	12.5	57.3
5	320	33.7	27.4	81.4
6	416	44.5	30.0	67.6

TABLE 5—REQUIRED SIZE OF SAMPLE FOR THREE DISTRIBUTIONS AT THREE PROBABILITIES

Dispersion coefficient (v)—	t	Percentage error of mean: 5	10	15	20
1/3	1	44	10	5	3
	2	178	44	20	11
	3	400	100	44	25
1/2	1	100	25	11	6
	2	400	100	44	25
	3	900	225	100	56
2/3	1	178	44	20	11
	2	710	178	78	44
	3	1,600	400	178	100

If we let ΔP represent the range within which means of samples of size n are to fall, then, since the distribution of the means will be symmetrical (Normal Law) about the objective mean, P, obviously the means will lie within the limits of the closed range,

$$P \pm \frac{\Delta P}{2},$$

with any desired degree of probability. Hence.

$$C = 100\frac{\Delta P}{2P}$$

where C is the percentage accuracy of the mean, P.

But

$$\Delta P = 2t\sigma_P$$

or from equation 1

$$\Delta P = 2t\frac{\sigma}{\sqrt{n}}$$

whence

$$C = \frac{100\,t\sigma}{\sqrt{n}\,P} = \frac{t}{\sqrt{n}}v \qquad (2)$$

where $v^9 = \frac{100\,\sigma}{P}$ is the coefficient of variation.

According to Equation 2 the accuracy with which a mean is known will depend upon the coefficient of variation of the distribution and the number of measurements in the sample for any assigned probability which is determined by t (see Columns 1 and 2 of Table 3).

Thus, for a given distribution, which fixes v, we may determine a mean within closer and closer assigned limits of accuracy, as fixed by C, merely by increasing the size of the sample; and we may then be sure that our results will be correct in the long run so many times out of a hundred as determined by t. Thus if our sample size is 512 (one-fourth of the 2,048 measurements) Equation 2 gives $C = 2.91t$ since the coefficient of variation, v, is

$$\frac{25.83 \times 100}{39.25} = 65.81.$$

Accordingly we may be sure that in the long run in two cases out of three ($t = 1$, $P = 0.6827$ from Table 3) we will have determined the mean within plus or minus 2.91 per cent. The four means each of 512 measurements were calculated to be 38.70, 38.98, 39.32, and 39.98 mils, respectively. In this instance they all lie within the range 39.25 ± 2.91 per cent or from 38.11 to 40.39 mils.

Once a set of measurements has been taken it is a simple matter to estimate the range of accuracy. But in a practical case we would like to establish the number of measurements that will be necessary to yield the accuracy we desire. Ordinarily there will be little information available upon which to base an estimate of the coefficient of variation. Such an estimate will be necessary in solving for n in Equation 2. Experience would be of great value in helping to assign a value to v. Unfortunately at present we have very little experience from which to draw. We do know that a characteristic of soil corrosion data is a relatively large dispersion coefficient. In Table 4 the dispersion coefficients of several pit depth distributions are given. It is clear from the table that values for the coefficient of variation not only may range over rather wide limits but that they are relatively large.

In Table 5 the number of measurements required for a given accuracy of the mean are grouped for three coefficients of variation, roughly covering the range in Table 4, and for the three probabilities corresponding to values of $t = 1$, 2 and 3. (See Columns 1 and 2 of Table 3.) These sizes of sample were calculated from Equation 2.

A casual inspection of Table 5 impresses us with the very large number of measurements required for any reasonable probability. Thus, if an accuracy of the mean with an error of not more than 10 per cent is required for a distribution having a coefficient of variation of two-thirds, samples of size 178 will yield means within the required error 954 times out of a thousand (see Table 3, when $t = 2$, $P = 0.9545$). To yield such means 997 times out of a thousand ($t = 3$, $P = 0.9973$) will require samples of size 400. In a practical case we would likely be satisfied with a probability corresponding to $t = 2$, or even in some cases to $t = 1$, since the cost of obtaining the large amount of additional data would likely not be warranted.

It should be clear that the preceding discussion has referred to a system as a whole. If the system could be logically subdivided, as, for example, into several parts depending upon the types of soils passed through, it is possible that the distribution of pit depths would be characterized by smaller coefficients of variations. The justification for a subdivision would rest upon the savings resulting from the fewer necessary excavations.

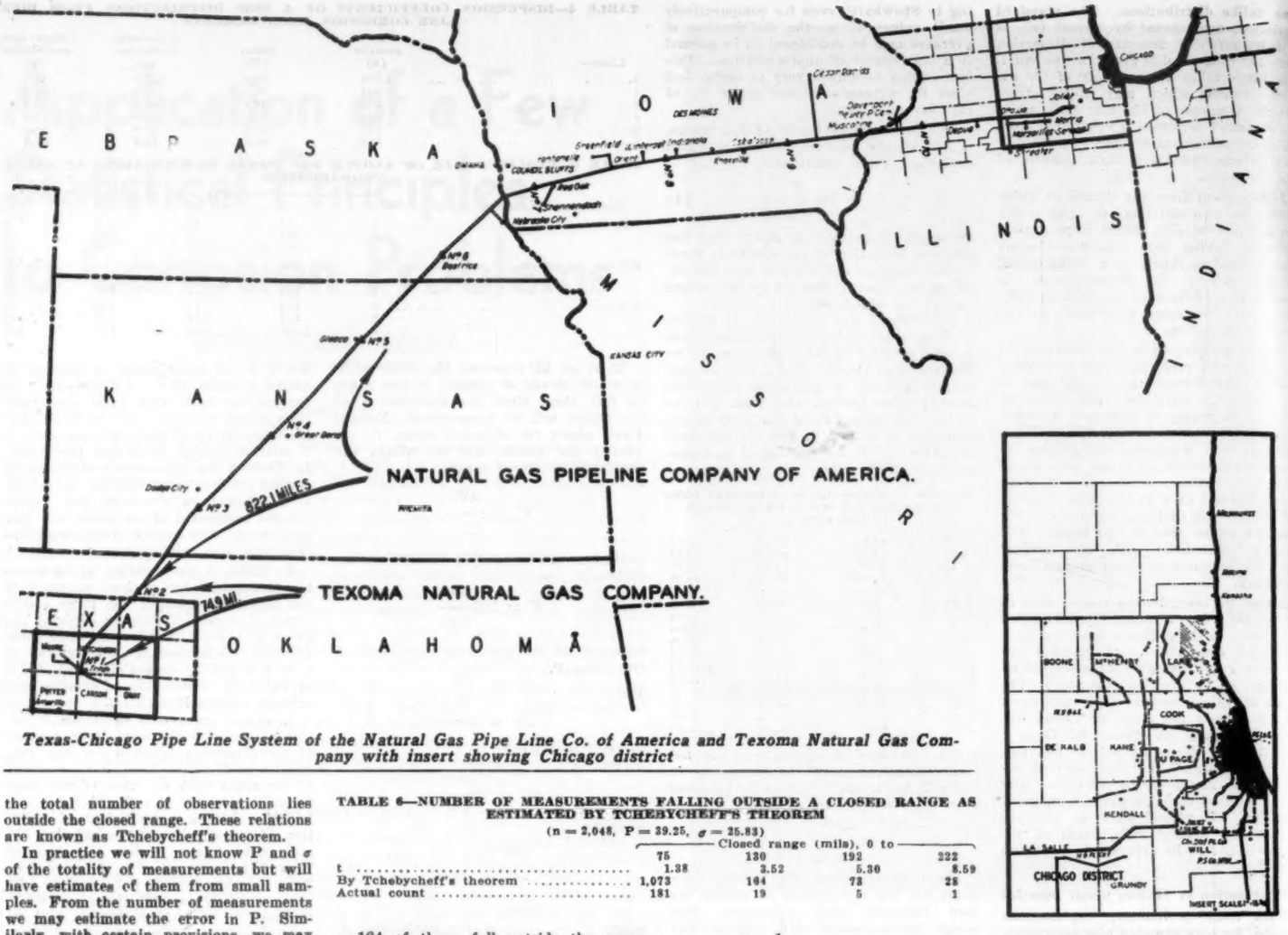
4. Application of Tchebycheff's Theorem

Since the distribution of the maximum pit depths of a corroded pipe line does not conform to a normal distribution, we cannot use the probabilities associated with t from the tables of the normal probability integral as we have done in the previous tables concerned with the distribution of means, in estimating the number of pit depths in closed ranges. We were safe in following the procedure in the case of means since, as we have observed, means are normally distributed quite precisely—even though the "parent" distribution of the individuals is skew.

Unreservedly, however, at least $(1 - \frac{1}{t^2})$ of the total number n of observations lies within the closed range $P \pm t\sigma$ (where t may be any value not less than 1), for any set of finite numbers no matter what their source or distribution.[10] Similarly, less than $\frac{1}{t^2}$ of

[9]A.S.T.M. Manual, p. 16.

[10]See A.S.T.M Manual, p. 23.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namely, that five measurements of the 2,048 are larger than 192 mils.

As before:

$$P = 25.54 \text{ and}$$

$$P + t\sigma = 192$$

$$\sigma = \frac{192 - 25.54}{t} = \frac{166.46}{t}$$

From Equation 4:

$$t = \sqrt{\frac{2{,}048}{1+5}} = 18.5$$

Therefore:

$$\sigma = \frac{166.46}{18.5} = 8.95$$

This calculation and the previous one give us confidence that the values of P and σ_s calculated from a relatively small sample will not fail—when used in connection with Tchebycheff's theorem—to overestimate the number of values, contained in the parent population, falling outside a closed range.

To review briefly the application of Tchebycheff's theorem we use an entirely different set of data.

A representative sample picked at random from a limited distribution comprised of 272 measurements yielded the following statistics: n = 34, P = 122.65, σ = 37.66. In the application of Tchebycheff's theorem for any value of t less than $\frac{122.65}{37.66} = 3.26$ a portion of measurements excluded will be less than the mean or 122.65. This calculation assumes that a minimum value of zero exists in the data. Actually the smallest value is 24.

What is the greatest number of the 278 lengths that can possibly require (a) spot welding and patching, and (b) patching? Can there possibly be any holes in the pipe (wall thickness 322 mils)?

The values of t are calculated as follows:

$$P + t\sigma = 192 \text{ (upper limit of range)}$$

$$t = \frac{192 - 122.65}{37.66} = 1.84$$

The lower limit of the range is:

$$122.65 - (192 - 122.65) = 53.39$$

From Tchebycheff's theorem the fraction of values lying outside of the range is not more than:

$$\frac{1}{t^2} = \frac{1}{(1.84)^2} = 0.296, \text{ and the number of values is } 0.296 \times 278 = 82.4.$$

The results of similar calculations are given in Table 7.

TABLE 7—ESTIMATED MAXIMUM POSSIBLE NUMBER OF VALUES OF A GROUP OF 278 FALLING OUTSIDE CLOSED RANGES CALCULATED FROM A SMALL SAMPLE OF SIZE 24

P = 122.65, σ_s = 37.66

Range	From 53.4 to 192	From 23.30 to 222	From 0 to 322
t	1.84	2.64	5.30
Estimated from Tchebycheff's theorem	82	40	9
Actual number of values less than lower range limit	11	..	..
Actual number of values greater than upper range limit	33	15	..
Total	44	15	..

It is evident from the table that certainly not more than 82 lengths will require patching and spot welding and of these not more than 40 will require patching. Actually, the respective number of lengths is 33 and 15. There may be a few pipe lengths punctured but certainly not over nine.

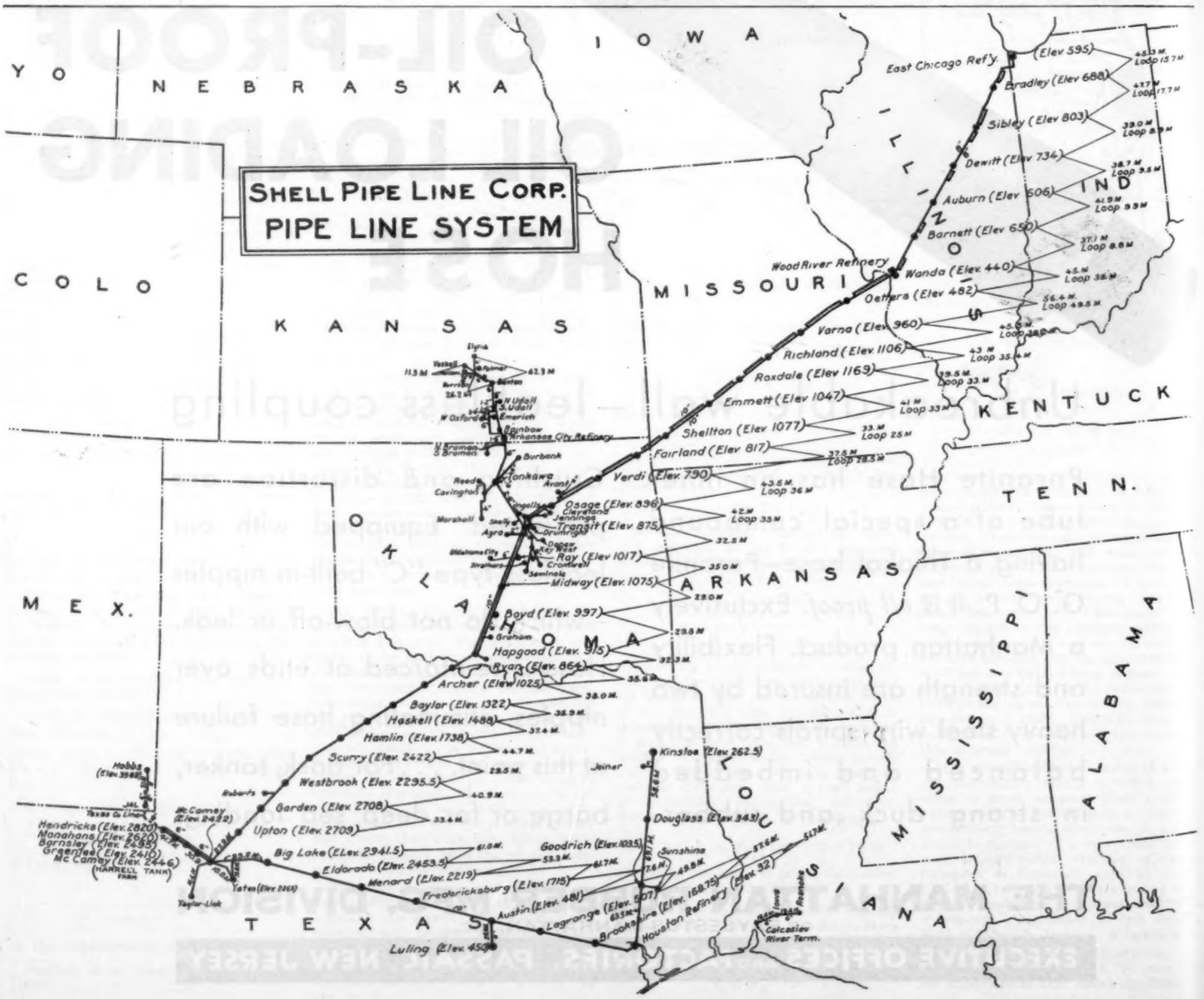
Summary and Conclusion

There is an evident need in the industry for an adequate method of quantitatively describing the condition of a pipe line. That such a method can be profitably employed has been noted by several references to practical problems that have arisen in the industry.

The application of statistical principles to the analysis of pit depth measurements has been shown to be feasible. The variation of means of small samples has been illustrated by actual data from pipe lines. The limits of variation of the mean can be accurately determined from any finite set of measurements. It is pointed out that one of the characteristic features of soil corrosion data is the wide dispersion which is found in the measurements. This condition necessitates the taking of surprisingly large samples in order to obtain results within known, reasonable limits of error.

Tchebycheff's theorem has been employed, in the case of the individual measurements, with practical certainty to predict from small samples the largest possible number of lengths of pipe having pit depths greater than arbitrary assigned values. While we cannot predict with accuracy the exact number of lengths of pipe having pit depths greater than an assigned value, we can definitely determine that the number of such lengths is not greater than a certain value.

For a problem of such vast importance as soil corrosion, there is a very evident lack of reliable data. For example, one of the serious difficulties confronting researchers in forecasting soil corrosion is the almost complete lack of information on how the various soils react on pipe lines in contrast to their action on short pipe sections. Though good correlations between laboratory tests of the corrosiveness of soils and the corrosion on isolated specimens have been obtained, relatively few correlations between laboratory tests and field experience have been attempted because of the lack of good data on the corrosion of pipe lines. The laboratory tests, to have practical value, must be checked against the cor-



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rosion experienced on pipe lines. The industry alone can furnish the necessary corrosion measurements.

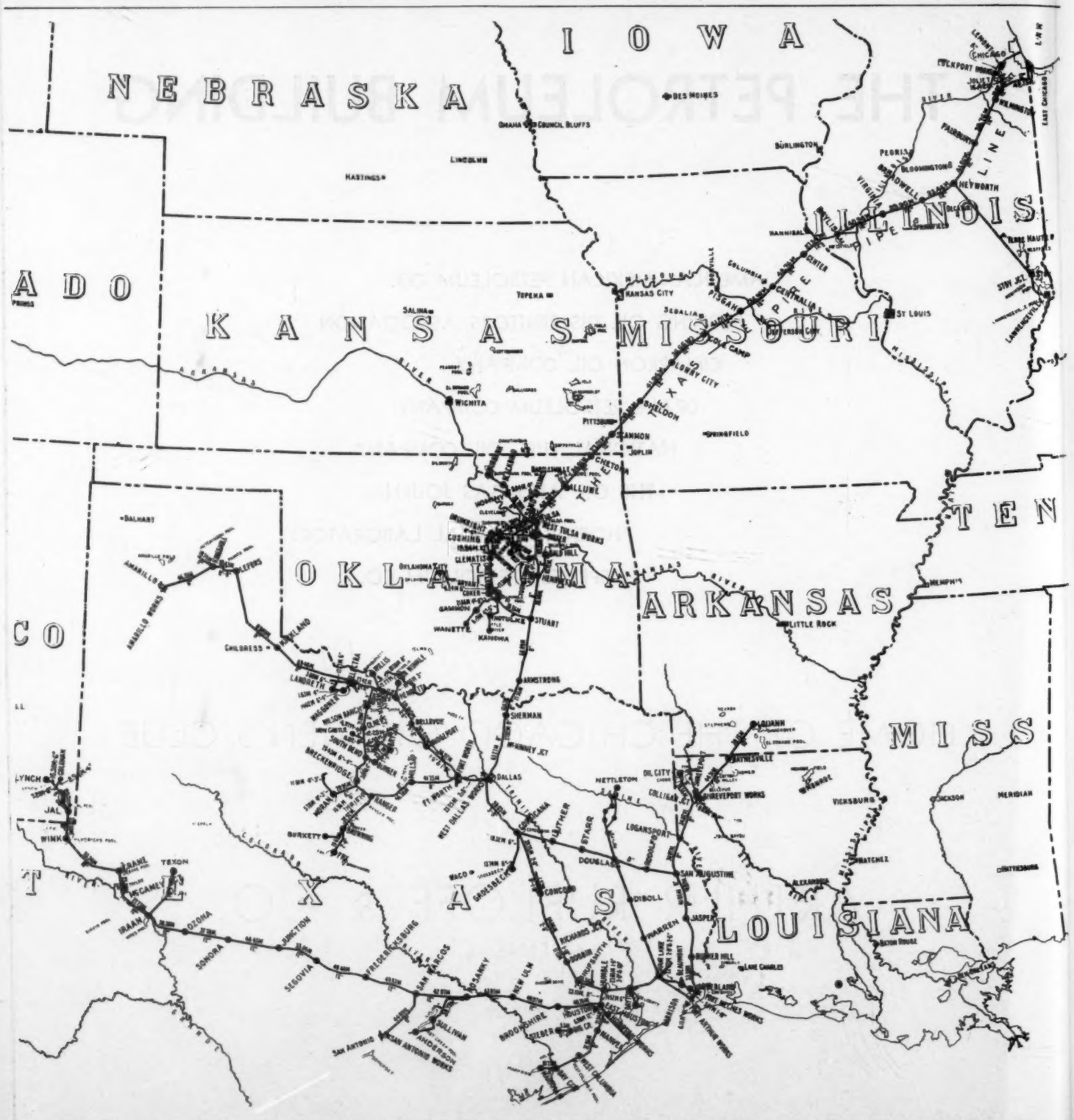
It is the author's opinion that the industry should foster a quantitative view of corrosion and begin the collection of quantitative data. No length of coated or uncoated pipe should be exposed or removed from the ground from now on without a quantitative description (maximum pit depth) of its condition being recorded. The manner of collecting such records should be uniform and described in detail so that records from different sources would be comparable.

The accumulation of such records would cause little or no additional expense and if confidentially or openly reported to a central agency would create information of inestimable value. The introduction to the industry of the gauge described by Heltzel has made it possible to measure pit depths simply, quickly, and accurately. With this gauge the author has explored the surface of an 8-inch pipe for the maximum pit as the length of pipe was emerging from a WKM cleaning machine. A subsequent examination of the length of pipe satisfactorily checked the original measurement. There is no reason why a line-walker, carefully instructed in the use of the gauge, could not make satisfactory measurements.

Had this plan been in operation a few years ago the solution of problems of this nature still perplexing the industry would have been reached. The practical uses which may be made of the data are too numerous to mention.

Companies subscribing to the plan would immediately benefit. The records reported to the company offices from the field would be in similar and readily understandable terms. Such expressions as "good pipe" and "bad pipe" would be replaced by an accurate, significant, quantitative description. A common language for the discussion and study of corrosion ills would result. A pipe line operator once stated that a study of his replacement records had convinced him that his various territories were relatively corrosive or non-corrosive depending upon his district foremen's mental conception of "bad pipe." The author has recently witnessed the reconditioning of long stretches of pipe. A quantitative description of the condition of the pipe would likely amaze the executives who pay the bills.

If the program just outlined were undertaken by the industry in a co-operative spirit for the primary purpose of supplying definite and reliable information, of which there is at present a very evident lack, research would be greatly stimulated. One use for such information would be for the study and further development of the methods proposed in this report for predicting from limited data the distribution of pipe lengths into assigned ranges of pit depths. Such methods, it is now obvious, are of value in the sale or purchase of pipe lines, and in the budgeting of reconditioning costs, they offer an exact basis for obtaining data in rate litigations and, finally, a rational system of pipe line valuation.



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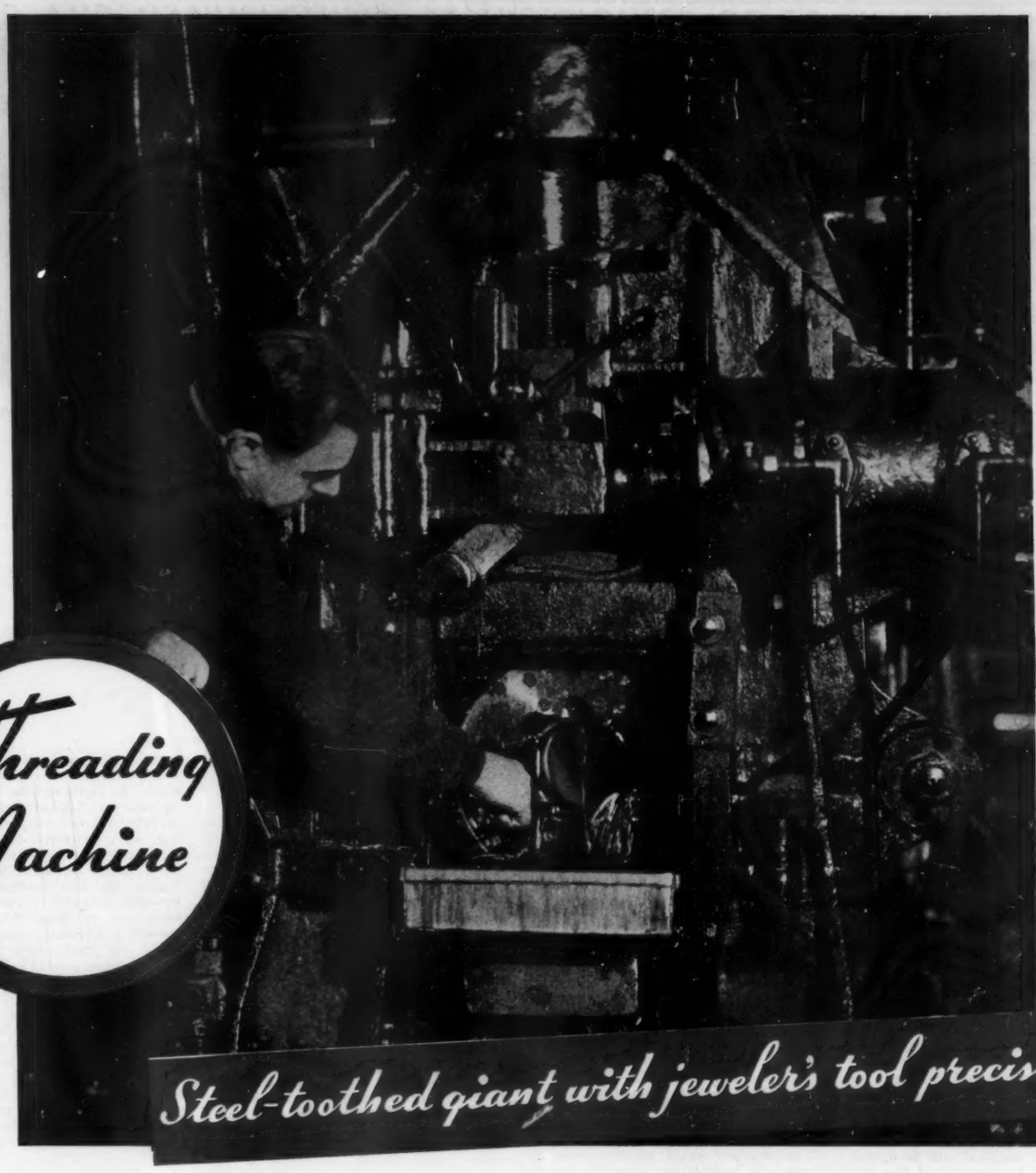

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Deep sea loading terminal at Tripoli from which first Iraq crude oil was loaded in tanker for shipment to France

Laying last part of the pipe line leading to the terminal of the Iraq Petroleum Co. line at Tripoli, Syria

Iraq Pipe Line, Largest Project Outside United States, Is Completed This Week

By C. O. WILLSON

This week marks a final step in the completion of a pipe line system which is the largest ever built outside the United States. It also has been the most important transportation project of the entire oil world over the past two years representing an expenditure of approximately $50,000,000.

Starting before the end of the month, regular deliveries will be made at the deep sea loading facilities at Haifa, Palestine, of the Iraq Petroleum Co., Ltd., one of two terminals of a 1,200-mile pipe line on which actual construction started two years ago. Regular shipments at Tripoli, Syria, the other Mediterranean terminal of the line, started September 15, following the loading of the first tanker in early August.

Due to the fact that all the pump stations are not completed, the present deliveries at each of the two terminals are about 21,000 bbls. daily, or approximately 50 per cent capacity. It is expected that the Tripoli terminal will be operating at capacity by the end of the year and the Haifa terminal not later than April 1, 1935. The line will then be delivering crude oil from the Kirkuk Field of Iraq at the rate of 4,000,000 long tons annually (80,000 to 85,000 bbls. daily).

Already the movement of oil from the terminals of the line has been reflected in the world movement of crude petroleum and its products, and this development will be more and more apparent over the next six months. Those responsible for the building of the line are arranging for regular tanker shipments to refineries of affiliated companies and the oil is being quoted for spot shipment at the Tripoli terminal. With terminals located in the center of one of the most important petroleum consuming sections of the entire world, the crude is replacing oil coming from the United States, South America, Mexico, Persia, and other sources of supply which are more distant from this market.

The marketing of this large supply is to be handled in an orderly manner but this does not alter the fact that due to its geographical location the new crude supply occupies a strong competitive position in world markets and will have no difficulty in replacing other sources of supply in the territory which can be readily served from the two terminals. There are unofficial reports to the effect that as new outlets for the crude are found, the capacity of the line will be increased which it is pointed out, can be done at a small fraction of the cost of the original project. The known reserves of the concession from which the crude oil is obtained would justify larger deliveries if considered desirable by its owners.

Loading line at Haifa for tankers

Establishes New Industry

It has been pointed that the expenditure of $50,000,000 to provide a major field with an outlet has been more than a pipe line project. In effect it has meant the establishment of an entirely new industry in sparsely inhabited countries whose people are of an older civilization and whose industrial and transportation facilities could contribute little to the carrying out of such a gigantic construction program.

The owners not only had to lay a line but they first had to erect hotels, homes, shops, warehouses, and garages, provide water supplies, build highways and establish on a permanent basis, living conditions to which oil people are accustomed. No line has ever been built in which as widespread use was made of all types of transportation. Practically all the equipment used was obtained from European countries and the United States. Rail transportation touched only a small part of the line and from these rail heads all types of trucks and tractors were used in getting the pipe line and construction materials and equipment to the right of way. The haulage necessary in transporting the pipe alone was 12,000,000 ton-miles.

Laying of Line

The total distance covered by the line is a little less than 1,200 miles with approximately 1,350 miles of line actually laid. Of this total all of the line is 12-inch with the exception of 200 miles of 10-inch. The locations of the lines are shown on the accompanying map. The line starts at Kirkuk, Iraq, adjacent to the field and all crude is being tendered at this point which is about 125 miles due north of Bagdad to which it is connected by rail. The line was laid from this point and also Haifa and Tripoli, the two terminals of the line .

The two lines run in parallel from Kirkuk to Haditha, a distance of 156 miles. At that point the lines bifurcate, one line going through Syria to Tripoli and the other leg continuing through Iraq, Transjordania and Palestine to Haifa. The total pipe line distance from Kirkuk to Tigris is 531 miles and from Kirkuk to Haifa, 618 miles.

The line has a total of 12 pumping stations with 45 pumping units. The three stations on the parallel lines from Kirkuk to Haditha are duplicate arrangements to provide for the operation of both lines. The north or Tripoli leg has four single pumping sets and the south or Haifa leg has five. The pumps are driven by 500-b.h.p. Diesel engines built by English, Swiss and French manufacturers. The line ultimately will operate at a pressure of 800 pounds. In order to start movement of oil, half of the stations were completed and the line will not be in position to operate at capacity until the remaining stations are installed and are ready for service. The stations depending on pumping conditions are located from 55 to 136 miles apart. Each station has shop, tankage and bungalows for employes with water ice and lighting facilities provided.

Beginning at Hassar which is 1,000 feet above sea level where the first pumping station is located, the line passes through the Kirkuk plain to Fatha Gorge where it crosses the Tigris River. Considerable difficulty was encountered in crossing this and other rivers. Supplies and store materials were transported across the Tigris and the Euphrates Rivers by means of "Blondin" ferries capable of carrying 1½ to 4-ton loads. The ferry consists of a conveyor running on a wire rope suspended across the river by means of a tower on each bank. From the Tigris, the line continues in a southwesterly direction crossing loose, blown sand and at Wadi Tharthar the line crossed a depression which was 400 feet above sea level. This immediate territory includes several miles of salt marsh and gypsum.

The Euphrates River is crossed at a point south of Haditha. The river beds and banks are rocky and considerable construction work was necessary before a satisfactory crossing was obtained. The "Blondin" at this point was larger than that used at the Tigris and was capable of transporting pipe and other heavy loads up to 4 tons. The third and last pumping station on the parallel lines is

Deep sea loading terminal at Haifa with observation tower of the Iraq Petroleum Co., Ltd. Regular tanker deliveries are now being made from this terminal

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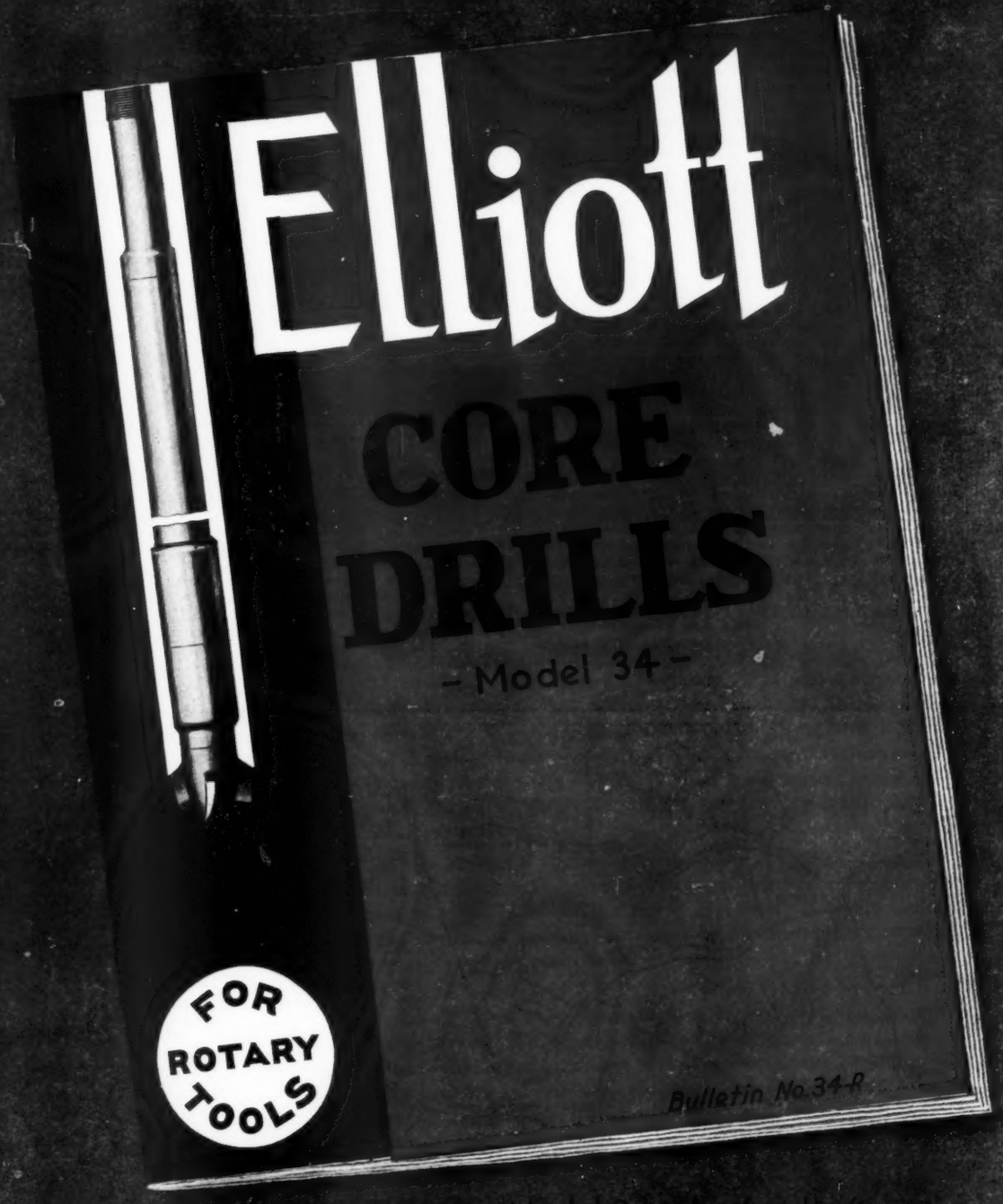

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located a mile from the west bank of this river.

From this point the laying of the south leg of the line did not present any especially difficult problems until the lava country was reached extending from Burqa a distance of approximately 100 miles. The lava in this country according to an official report is a basalt rock appearing in some places as a solid sheet and in others as loose boulders with loose abrasive soil beneath. When it is completed it is planned to have the entire line buried 3 feet beneath the surface and in a country as has just been described the construction of the line has been a slow and tedious project. All the pipe is treated and wrapped to minimize as much as possible, corrosion which is certain to be a major problem at many points along the line.

The laying of this leg of the line was accompanied by quick changes in elevation in the territory extending west from the Jordan River. After leaving Mafrak the pipe line route passes through limestone hills on the way to the river, rising to 2,600 feet above sea level after it passes Irbid, 18 miles east of Jordan and then falling very rapidly to the Jordan Valley at which point it is 850 feet below sea level. From Irbid the line passes through populated districts with numerous villages. It again rises rapidly so that 10 miles west of the Jordan it is 750 feet above sea level. Thereafter it falls steadily through the valley of Esdraelon to the terminal site on the Bay of Acre. The site is located in the sand dunes 2 miles to the northeast of the town of Haifa.

The changes in terrain and elevation on the north leg of the line which was completed first are similar to those on the south leg. For short distances the route includes plain country where the terrain was similar to that found in the Southwest and Middle Western part of the United States. Other sections are rocky presenting problems in transporting pipe with blasting necessary to secure trenches for burying the line.

Most of the country through which the line runs is a desert. In the course of a year there are extremes in cold and heat and over a portion of the line the country is subjected to the ravages of floods during the rainy season. To cope with this situation practically every type of motor driven vehicle was used in the movement of the pipe, engines, pumps and other equipment. Water is not obtainable at many points along the line and had to be transported long distance for workmen. It is estimated that as high as 12,000 native and foreign workmen were employed at one time in the construction of the line.

Equipment incidental to the construction and operation of the line constitutes a major expenditure. Over 1,000 miles of overhead telegraph and telephone lines have been installed. Approximately 25,000 steel tubular poles with cast iron bases and a like number of timber crossarms were used. This communication equipment which is part of the permanent operating facilities included 120,000 spindles and insulators and over 4,000 miles of cadmium copper wire. At the Tigris and Euphrates Rivers the towers for carrying the wires are 130 feet high.

Deep Sea Loading

One of the most interesting features of the line recently completed are the deep sea loading facilities at both Tripoli and Haifa. Harbor facilities for loading are not available although improvements are being made at Haifa which will enlarge the usefulness of that point as a transportation center. At both terminals large tankers cannot approach within 1 mile of the shore. The minimum depth at Tripoli with the deep sea loading line is 52 feet and the maximum is 56 feet at mean tide. Tripoli has three berths. Haifa has two berths of 53 and 54 feet respectively.

Storage facilities at each terminal will total approximately 1,500,000 bbls. when completed. The present storage equipment at Tripoli includes fifteen 93,000-bbl. crude tanks which were recently completed.

Operation of Line

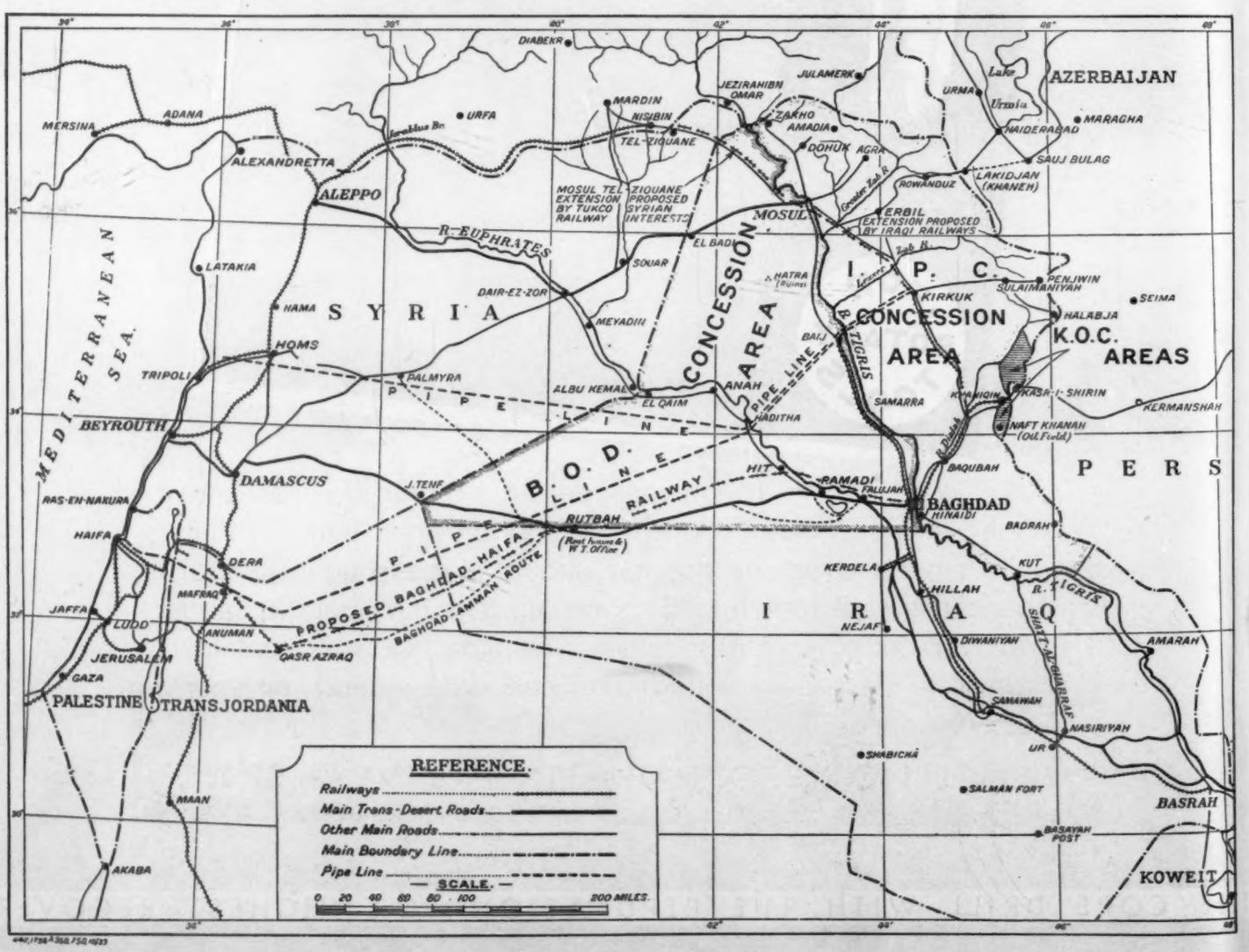
The pipe line is owned by Mediterranean Pipe Lines, Ltd., and was built by Iraq Petroleum Co., Ltd., and which holds the 75-year concession from the Iraq government from which the crude oil is being obtained. The Iraq Petroleum Co., Ltd., has its headquarters at City Gate House, London, England. The company has no refineries nor marketing facilities but through it constituents does have tankers which are available for transporting the crude from the terminal to refineries.

There are four principal owners of the Iraq company, all of which are represented in its board of directors. Four companies, the Anglo-Saxon Petroleum Co. (Royal Dutch-Shell); Compagnie Francaise des Petroles (French group); D'Arcy Exploration Co. (Anglo-Persian Oil Co., Ltd.) and the New East Development Corp. (American group of three companies) each own 23.75 per cent of the total capital stock. The Participations & Investments, Ltd., of the Gulbenkian interests who were responsible for the early negotiations in securing concessions, hold a 5 per cent interest.

The Near East Development Co. with headquarters in New York consists of the Standard Oil Co. (New Jersey), Socony-Vacuum Oil Co., Inc., and the Gulf Oil Corp. with the Standard companies holding controlling interest. At one time other major American oil interests were interested in the project but either withdrew or sold their stock to the remaining American companies.

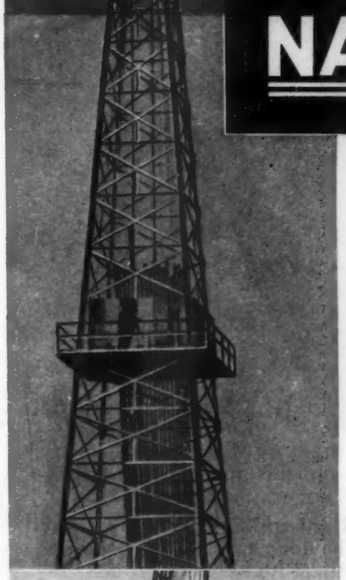
All four of the major owners of the Iraq company are important factors in European oil markets aside from their ownership in the Iraq company. These companies have large refinery capacities in Europe through subsidiary or affiliated companies and it has been assumed that they will absorb practically all of the Iraq crude oil available at this time. This will necessarily replace crude obtained from other fields. It is pointed out in this connection that the demand for motor fuel and some of the other petroleum products is rapidly increasing at this time and this gain in demand will tend to offset the excess situation in regard to crude oil supplies which would normally develop when new supplies up to 82,000 bbls. daily are made available within a period of a few months.

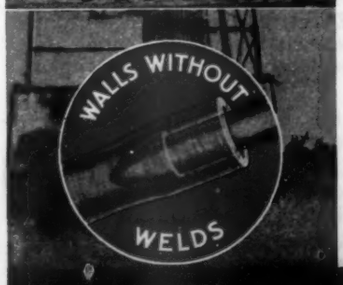
It is probable that a large part of the crude from the Iraq line will be refined in France. Under a government program which has sought to develop refining facilities in that country a number of new refineries have been built and old plants remodeled and enlarged over the past



Official map of location of concessions and pipe line in Iraq

Another world's record chalked up for NATIONAL CASING





Longest string of Casing ever run—10,301 feet of NATIONAL Seamless Special Diamond B8 Casing—landed in the record running time of 18 hours without mishap.

Once more, NATIONAL Casing makes a world's record, this time in Gulf Production Company's J. T. McElroy 103, Upton County, Texas—10,301 feet of 7-5/8" O.D. NATIONAL Seamless Special Diamond B8 Casing with long threads and couplings. As in the recent Denver Producing and Refining Company's well in Caddo County, Oklahoma—where NATIONAL Casing chalked up the previous world's casing record of 9,910 feet—once again established merit pointed to the source of tubular material.

No. 103 McElroy is 10,630 feet to the bottom. Casing was put down in actual running time of 18 hours. Noteworthy in this remarkable demonstration was the fact that this record depth was made with the regular long threads and couplings developed by National Tube Company and which gave perfect performance.

That new world's-record wells are equipped with NATIONAL is easily explained. When really hazardous work is contemplated, only pipe and casing of the highest dependability can be considered. And experienced operators know the qualities of NATIONAL Oil Country Tubular Products. Great strength, extraordinary toughness, exceptional ductility, superior threads, and unequalled all-round capability to meet the most rigid demands justify the continued preference for NATIONAL.

It is interesting to note that in the McElroy well, 10,700 feet of NATIONAL Special Alloy Drill Pipe was also used, establishing a new record for drill pipe in the West Texas area.

When the going is rough, when new depths and new problems are to be encountered, take no chances—specify NATIONAL—

America's Preferred Drill Pipe—Casing—Tubing

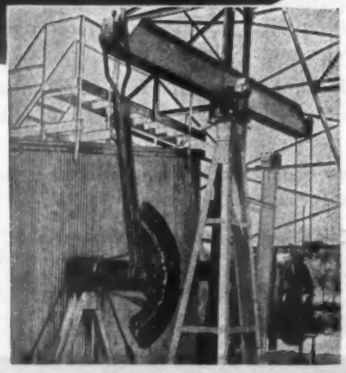
NATIONAL TUBE COMPANY · Pittsburgh, Pa.

Subsidiary of United States Steel Corporation

NATIONAL SEAMLESS

DRILL PIPE - CASING - TUBING - LINE PIPE

✓Check THE FEATURES of Parkersburg Type "C" Counterbalance



THE PARKERSBURG RIG AND REEL CO.
TRADE MARK REG.

✓ **1. Ease of Mounting and Demounting**—Main and auxiliary weights can be removed or attached in a few minutes.

✓ **2. Rigid and Compact Assembly**—The unique manner of removing all strains from connecting bolts assures a permanently tight assembly.

✓ **3. No Load on Assembly Bolts**—A tongue and groove arrangement removes all torque and centrifugal loads from assembly bolts.

✓ **4. Adaptable to Any Well Condition**—The Type C Counterbalance is completely adaptable to any well condition no matter how light or heavy the load.

✓ **5. Range of Effective Weight**—In the sixth hole an effective weight range of from 3825 pounds to 10759 pounds can be secured.

✓ **6. High Ratio of Effective Weight to Actual Weight**—The very efficient weight distribution results in an unusually high ratio of effective weight to actual weight.

The Type C Counterbalance is a rigid and compact assembly offering many advantages not found in other types of rotary counterbalances.

Based on effective weight, the cost is no greater than that of other counterbalances of similar type.

See the nearest Parkersburg Representative or send for Booklet B-7-33

THE PARKERSBURG RIG & REEL CO.

Executive Offices and Main Plant

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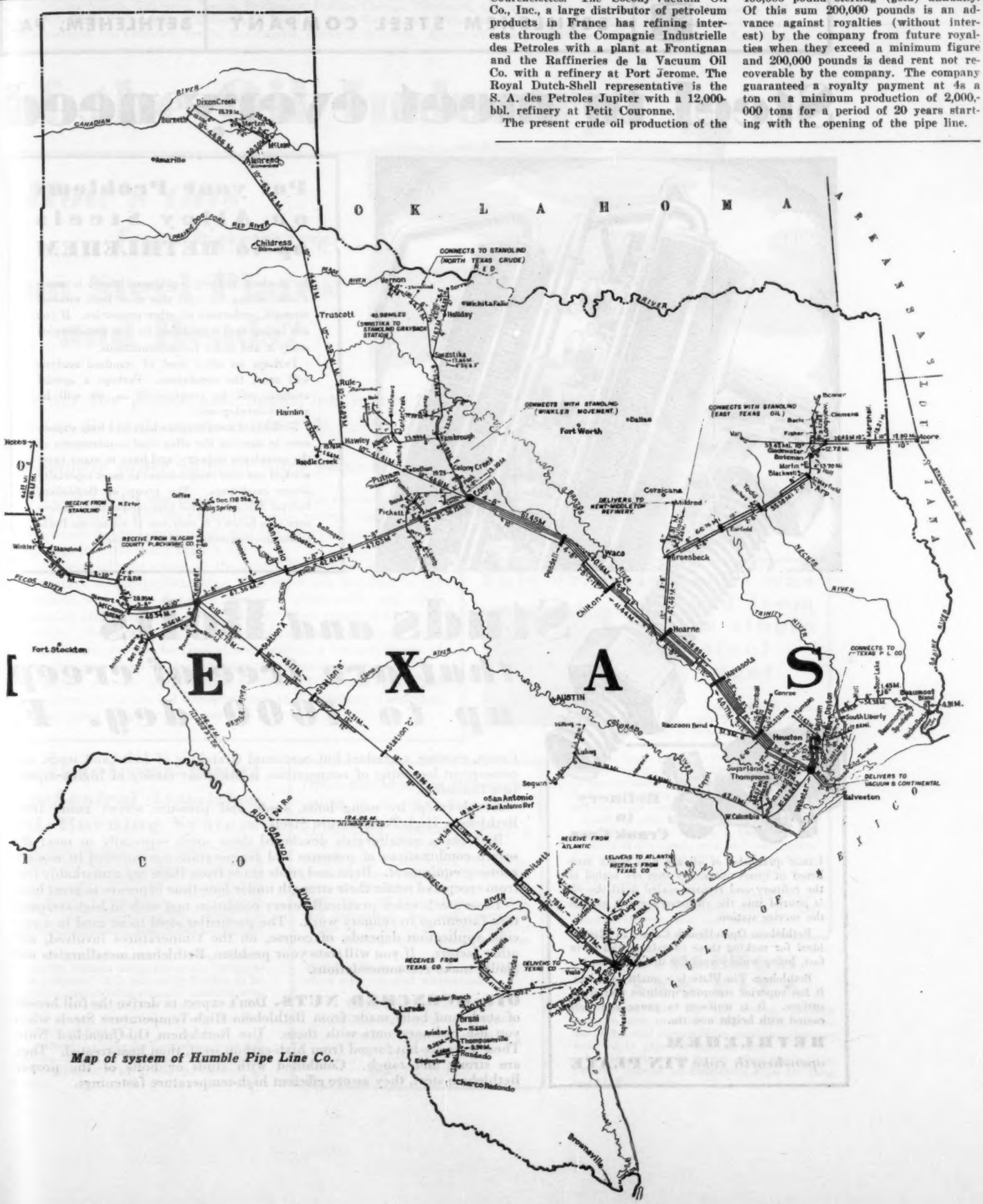
three years so that now they have a total crude oil capacity of approximately 100,000 bbls. daily. It so happens that all of the principal companies owning stock of the Iraq company, have old or new plants in France through subsidiary or affiliated companies.

The Cie Francaise de Raffinage, a subsidiary of the Compagnie Francaise des Petroles has a refinery at Havre with a capacity of 22,000 bbls. of crude oil daily and this plant was the first to refine Iraq crude on a commercial basis last month with regular runs being made at this time. The company also has a smaller refinery under construction at Martigues near Marseilles. The Standard Oil Co. (New Jersey) along with the Gulf Oil Corp. and the Atlantic Refining Co. through the Standard Franco-Americaine de Raffinage are the owners of a new and complete refinery at Port Jerome having a capacity of 20,000 bbls. daily.

The Anglo-Persian Oil Co., Ltd., is interested in the Societe Generale des Huiles with two refineries at Lavera and Courchelettes. The Socony-Vacuum Oil Co., Inc., a large distributor of petroleum products in France has refining interests through the Compagnie Industrielle des Petroles with a plant at Frontignan and the Raffineries de la Vacuum Oil Co. with a refinery at Port Jerome. The Royal Dutch-Shell representative is the S. A. des Petroles Jupiter with a 12,000-bbl. refinery at Petit Couronne.

The present crude oil production of the Iraq company is coming from what is known as the Kirkuk structure a part of an exclusive grant of 32,000 square miles in the vilayets of Baghdad and Mosul. The present production is obtained from producing zones found from 1,000 to 3,000 feet in wells scattered over part of the structure.

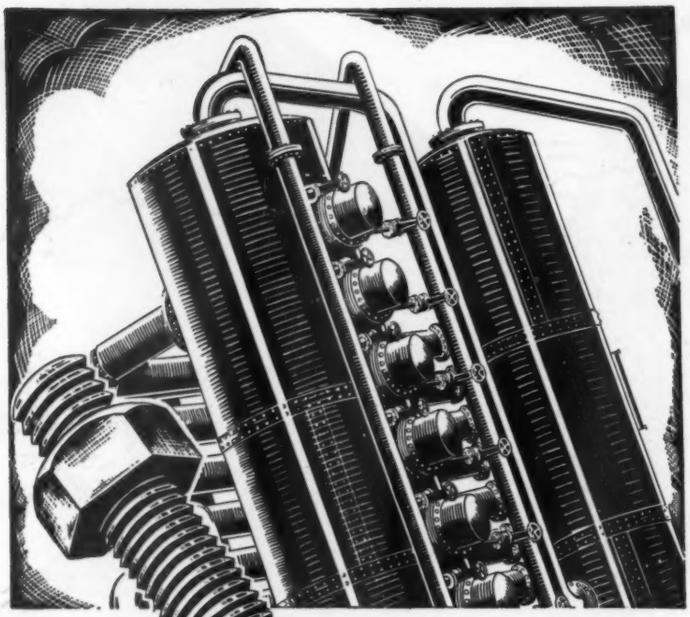
The company pays the government 400,000 pound sterling (gold) annually. Of this sum 200,000 pounds is an advance against royalties (without interest) by the company from future royalties when they exceed a minimum figure and 200,000 pounds is dead rent not recoverable by the company. The company guaranteed a royalty payment at 4s a ton on a minimum production of 2,000,000 tons for a period of 20 years starting with the opening of the pipe line.



Map of system of Humble Pipe Line Co.

BETHLEHEM STEEL COMPANY | BETHLEHEM, PA.

Steel to meet every need



Put your Problems on Alloy Steels up to BETHLEHEM

In modern refinery equipment there is many a task calling for steel that must have unusual strength, endurance or other properties. If you are facing such a problem, let our metallurgists study it and make recommendations.

Perhaps an alloy steel of standard analysis will meet the conditions. Perhaps a special analysis will be required—if so, we will be glad to develop one.

Bethlehem metallurgists have had long experience in meeting the alloy steel requirements of the petroleum industry, and have in many cases worked out new compositions to meet especially severe conditions. The group of Bethlehem Special Alloy Steels for high-temperature fastenings (see below) is only one of numerous Bethlehem developments in this direction.

Studs *and* Bolts *that are free of creep up to 1000 deg. F.*

Creep, causing a gradual but continual stretching of bolts and studs, and consequent loosening of connections, is the great enemy of high-temperature fastenings.

Avoid creep by using bolts, studs and pressure screws made from Bethlehem High-Temperature Steels.

Bethlehem metallurgists developed these steels especially to meet the severe combinations of pressure and temperature encountered in modern refinery equipment. Bolts and studs made from them are remarkably free from creep and retain their strength under long-time exposure to great heat.

These steels cover practically every condition met with in high-temperature fastenings in refinery work. The particular steel to be used in a specific application depends, of course, on the temperatures involved, and other factors. If you will state your problem, Bethlehem metallurgists will gladly make recommendations.

OIL-QUENCHED NUTS. Don't expect to derive the full benefit of studs and bolts made from Bethlehem High-Temperature Steels when you use ordinary nuts with them. Use Bethlehem Oil-Quenched Nuts. These nuts are hot-forged from high-carbon steel, then heat-treated. They are strong and tough. Combined with studs or bolts of the proper Bethlehem steel, they assure efficient high-temperature fastenings.

Refinery to Crank Case

Large quantities of oil are now being marketed in quart containers that are sealed at the refinery and remain sealed until the oil is poured into the customer's crank case at the service station.

Bethlehem Open-Hearth Coke Tin Plate is ideal for making these containers and is, in fact, being widely used for this purpose.

Bethlehem Tin Plate is a quality product. It has superior stamping qualities and clean surface. It is uniform to gauge and well coated with bright new tin.

BETHLEHEM
open-hearth coke **TIN PLATE**

District Offices: Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Honolulu. *Export Distributor:* Bethlehem Steel Export Corp., New York.

of the Oil Industry

How's this for Service on Steel Plates and Heads?

Order for plates and heads for forty 64-in. dia. tanks received 1:00 P.M. Friday

Complete order shipped 6:00 Saturday

WHEN the order was received, slabs of the desired analysis were available. But the plates had to be rolled, discs cut out, the heads flanged and dished, and the entire shipment loaded on cars in little more than a day.

No special procedure in the usual Bethlehem service was necessary to accomplish this. The order was handled in the regular way. Our flanging shop and plate mills and steel-making units that feed them are geared for speed in handling orders. Not only plate mills, but open-hearth furnaces, even blast furnaces, are located almost within a stone's throw of the flanging shop, and are under the same management.

That's why so many buyers of Steel Plates and Heads for applications in the oil industry turn to Bethlehem when they want quick service. And get it.

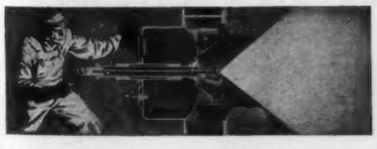
This cracking still was forged from a single steel ingot

IN making forged cracking stills Bethlehem starts with an ingot. First the ends are discarded, then the center is pierced, leaving only the best, soundest, strongest metal. The forging is worked out to approximately the final size on a giant hydraulic forging press, inside machined, and the ends "necked down."

Cracking stills made in this way are safe, and incomparably strong. The thorough working of the metal, over and over, makes it homogeneous and gives it a dense grain structure. And there's not a seam or a joint in the entire vessel.

Bethlehem facilities permit making these one-piece forged cracking stills in any length, diameter, and wall thickness.

Bethlehem-Dahl *Mechanical Atomizing* Oil-Burning System



THIS oil-burning system atomizes oil mechanically, without using any steam for atomizing purposes. It is extremely flexible in its operation, maintaining virtually uniform pressure over a wide range of loads. It can be applied to any type of boiler and handles any grade of fuel oil.

Catalog describing the Bethlehem-Dahl Oil-Burning System in detail and showing typical installations will gladly be mailed on request.

Other Bethlehem Products used *in the* Oil Industry

CORROSION-RESISTING STEELS — A grade for every purpose.

FORGINGS — Carbon and alloy steel; hammered and hydraulically-pressed; drop and upsetter.

SHEETS — All kinds of sheets: Black and galvanized, flat and corrugated. Sheets of Beth-Cu-Loy (copper-bearing steel) for resistance to atmospheric corrosion.

WIRE — Plain and galvanized; Bethanized wire (special zinc-coated).

CARBON STEEL BARS
SPECIAL ROLLED SECTIONS
STRUCTURAL SHAPES
PIG IRON
BOILER TUBES

BETHLEHEM LINE PIPE

BETHLEHEM PIPE has the strong, uniform sections, with smoothly finished ends, and the flexibility and easy-welding qualities that are essential in pipe for line service.

In pipe-line work, in any other application, you can depend on Bethlehem Pipe for long, trouble-free service.

Welding Development in Pipe Line Industry Has Made Operations Far More Efficient

Making a bell hole weld

Beveling 8-inch salvaged pipe

By ALBERT N. HORNE
General Superintendent, Empire Pipe Line Co.

Available records show that the first use of oxwelding in pipe line construction was 1,000 feet of 4-inch gas line in 1911, in Philadelphia, and 5,000 feet of 8-inch gas line in 1912, in San Francisco, both being oxwelded. In the summer of 1916, the Empire Companies constructed 28 miles of 12-inch all welded gas line from Valley Center to El Dorado, Kans. Construction of 40 miles of 3-inch gasoline line was started in 1917 from Salt Creek to Casper. The Prairie Pipe Line Co. was first to adopt oxwelding as standard for oil pipe lines when, in 1920, a 15-mile 8-inch oil line was laid from Bartlesville to Ramona, Okla.

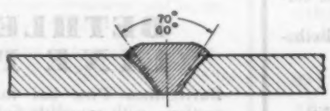
From this time on, the large tong gangs for pipe line construction rapidly gave way to welded construction, though it was not until 1926 that welding had the majority usage. However, maintenance and repairs of lines and equipment and construction of manifolds by oxwelding were getting to be well established.

Arcwelding in maintenance and repairs of lines and equipment was not used very extensively until 1926, though used as early as 1923 in construction of storage tanks. In 1929, arcwelding was used on bell and spigot joints, or buttwelds with back-up rings, on large gas lines. Arcwelding of butt joints was used on a small scale as early as 1926, but did not come into general usage until 1932.

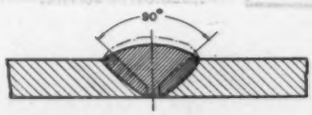
In order to completely follow developments in oxwelding of the past few years, we should review some of the fundamentals of welding technique.

Welding Technique

Oxwelding is the application of the heat of the oxy-acetylene flame in such manner that a metal rod is melted and deposited on a molten foundation, resulting in the proper fusion of the two metals into a joint. The flame is played on rod and base metal in such manner as to form a puddle, and when sufficient metal has been added, the puddle is manipulated forward in the joint, allowing the built-up joint to solidify. In the process of fusion, oxides and nitrides are formed, and oxides are already present in the form of mill scale, rust, etc. These oxides and nitrides, if in excess, cause crystallization, and consequent brittleness, with uncertain joint efficiency. In order to produce a satisfactory joint, these oxides and nitrides must be kept to a minimum. And this is one of the factors leading to changes in technique.



TYPICAL BACK HAND WELD



TYPICAL RIPPLE WELD

Figure 1

In the early days of welding, joint efficiencies had wide variations, ranging as often below 50 per cent as above. This was because the welder knew little about the metallurgy and the mechanics associated with the processes of fusion and solidification.

Early-day welders used varying techniques. The first pipe lines were welded with the "spot" or "puddle" method. Some used the forehand and some the backhand, though the forehand or ripple weld quickly became the standard in pipe line welding. The ripple weld remained standard until about four years ago, when through continuous study and experimentation, along with developments in welding rod composition, the backhand method was perfected to such a degree in pipe welding as to be revolutionary.

Up to about six years ago, line pipe was of the conventional lapweld, low carbon steel, with tensile strength of around 50,000 pounds per square inch. The need for higher operating pressures and the economic advantage of lighter weight forced the development of seamless and electric welded high carbon pipe. The carbon content was raised from around 0.18 up to 0.30 and 0.40 and even higher, and the tensile strength was increased to around 80,000 pounds and higher.

To secure welds of strength comparable to that of the newer pipe development, it was then necessary of the metallurgist to get busy on welding rod composition. The almost pure steel, or very low carbon rod did not give the required strength nor did a higher carbon content alone solve the problem. It was, therefore, necessary to go into alloys, together with various changes in technique.

In order to follow through more clearly on this development in technique, the following is quoted:

"A description of two basic techniques for welding iron and steel with particular reference to pipe welding will illustrate the application of the principles. The essential difference between the two techniques is in the direction in which the flame is pointed with respect to the direction of welding, whether back against the completed weld, or ahead—away from the completed weld.

"With backhand technique, an overhead weld with the pipe horizontal is made by starting at the top of the joint and carrying the puddle to the bottom then restarting at the top and completing the opposite side. In the case of forehand technique, the weld is started at the bottom and finished at the top.

"There are other differences between the two basic welding techniques besides direction of welding. With forehand technique it is necessary to move flame and rod alternately from one side of the puddle to the other so the flame will be free to bear first on one side of the vee, then the other.

"With backhand technique, however, flame and rod can be moved in the same or opposite directions as desired. When welding in the flat position as for rotation welding, it is rarely necessary to give rod and flame any sideways motion whatever. Thus, the hottest portion of the flame is directed almost constantly against the end of the welding rod, increasing the rate at which the welding rod melts.

"Another advantage of backhand technique is the ability of the welder to observe the sides and bottom of the vee in advance of the puddle at all times. Thus he can be assured that fusion is taking

Portable weld testing machine mounted on car for making weld tests in field

place without excessive melting of base metal. Contraction of the spacing ahead of the weld is also less with this technique.

"With either of these two general techniques, it is practicable to carry a puddle which will complete in one pass a single vee weld in pipe with wall thickness up to one-half inch. The puddle ex-

Figure 2—View of backhand welding

tends the full width of the weld being made and a distinct ripple finish is produced on the surface, denoting regularity of rod and flame manipulation."

This brings us to the development of the "Lindeweld," "Aircoweld," or backhand application.

Figure 1, lower, shows a cross section of what is considered a good forehand or ripple weld. Usually the bead is built higher, as shown by broken line, and the penetration is deeper than indicated. Practice demanded that a high, wide bead be built up, and that the two edges to be joined be deeply penetrated by the heat—"burned in." This required a great amount of heat, and necessitated manipulation of a very large puddle, all of which required time and material.

Radiography and photoelastic studies of recent years have shown that the high bead is not necessary, and, in fact, may tend to weaken joint efficiency, because of concentration of stresses on each side of the bead.

Proper Fusion

Metallurgical studies showed that the "neutral flame," which was considered the best practice for forehand or ripple welding, permitted a greater formation of oxides than was safe, and caused a lowering of carbon content of the base metals. These studies also proved that the proper fusion of weld metal and base metal could be attained without deep penetration and large puddle. This was achieved by using an alloy rod with slightly lower melting point and a carburizing flame, or an excess amount of acetylene, which causes the surface metal to absorb enough carbon to lower the melting point below that of the adjacent metal. This quick reduction of the surface to the molten point permits the requisite bonding, and tends to keep the carbon content of the weld metal in line with that of the base metal. The reducing action of the excess amount of acety-

Figure 3

lene helps further to eliminate oxides and nitrides and prevents their formation. A typical backhand weld is shown in Figure 1, upper.

The advantages attained in the development of the backhand methods are summarized as follows:

1. Reduction of oxides, which gives better control of the puddle.
2. Less weld metal required.
3. Carbon content of weld more uniform with that of base metals.
4. Increased speed and efficiency.
5. Smaller bevel angles, saving time and material.

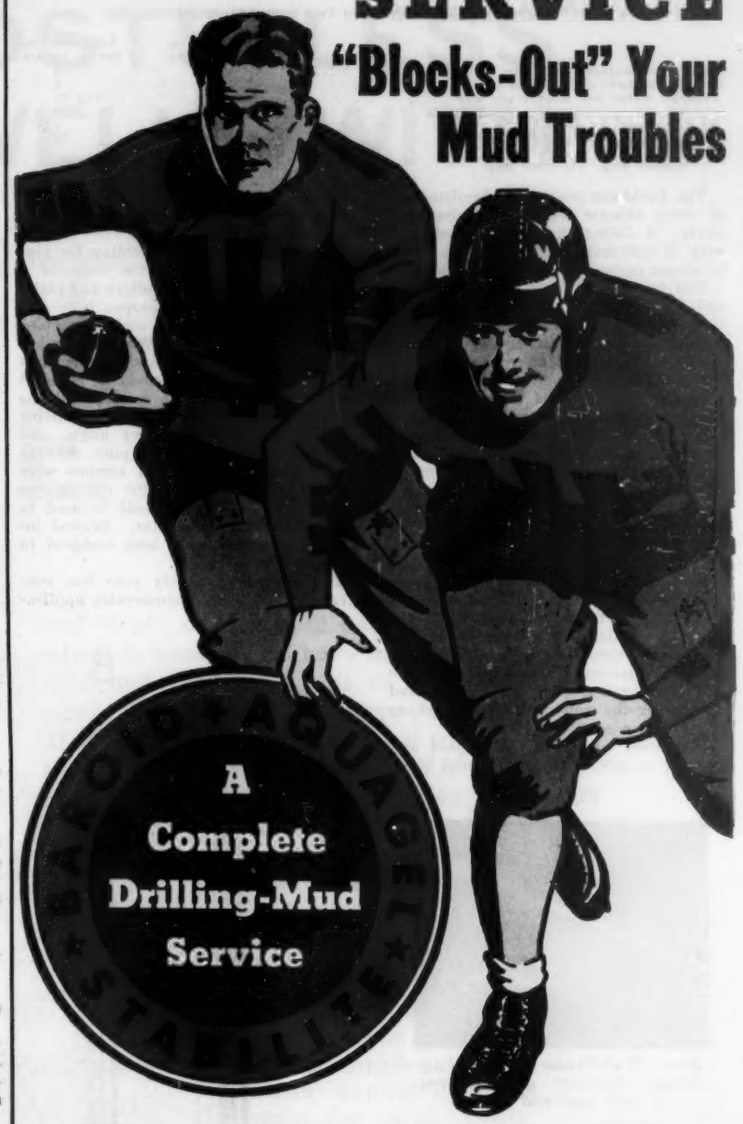
This newer technique, attained by properly alloyed welding rods, made possible greatly increased speeds and decreased costs. The backhand method is

Spraying 19½-inch diameter cast iron piston for 150 h.p. Diesel engine, using mild steel wire

BAROID

SERVICE

"Blocks-Out" Your Mud Troubles



"BLOCKING-OUT" tacklers is highly important in winning football games.

"Blocking-Out" mud troubles is equally important in drilling oil wells!

Baroid Sales Company maintains a complete drilling mud service in all active oil fields under the direction of trained engineers. These men are available for advice and consultation, without obligation. Let them check up on your mud to avoid troubles and expense.

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BAROID—Extra-Heavy Colloidal Drilling Mud
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National Pigments & Chemical Co., St. Louis

approximately three times as fast as the ripple weld method, and requires about half the material. The following tabulation gives the approximate comparison:

	Backhand	Ripple
Time	3 lin. inch minute	1 lin. inch minute
Oxygen	1¼ cu. ft. per dia. inch	2½ cu. ft. per dia. inch.
Acetylene	1.1 X oxygen	0.9 X oxygen
Rod	0.6 of ripple weld	

The following tabulation pictures results on two comparable jobs:

	Ripple welding 500 mi. 10" line	Lindewelding 200 mi. 10" line
Number of welders on firing line	16	4
Number of spell-off welders	4	1
Average welds per welder per day	*12–13	†33–35
Oxygen and acetylene per weld, cu. ft.	42	18
Welding rod per weld, lbs.	3½	1½
Average welds per welder per hour	1.4	3.4

*9-hour day. †10-hour day.

The backhand weld has permitted use of much thinner walled pipe than formerly. A 12-inch line was recently laid with $\frac{7}{32}$-inch wall thickness, which would be almost impossible with the ripple weld.

Bell hole welds have been speeded up and simplified to a remarkable degree. It is no longer necessary to have such large holes and clearance, and the speed of the tie-in gang is more than doubled.

A further development in speed and economy in welding is pictured in Figure 3, semi-automatic welder. This is a two-flame blowpipe to which is attached an automatic gravity feed rod holder and two runners to serve as a supporting guiding carriage. The runners are adjustable for different size pipe, and a trigger device raises or lowers the rod when passing over tack welds.

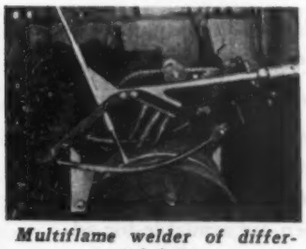
The two flames and rod holder are aligned in the plane of the pipe joint, and the lower or larger flame prepares the base and melts the rod, while the upper or smaller flame preheats the rod.

This semi-automatic welder is used in the same manner as the hand blowpipe in the backhand method, and has resulted in reducing the welding time as much as 25 to 35 per cent.

The latest contribution to speed and economy in oxwelding is the hand blowpipe equipped with the multiflame welding head, pictured in Figure 4.

Figure 4

New Multiflame Welding Head, showing gas orifices in side and end of tip



Multiflame welder of different type

Multiflame Technique

The technique of the multiflame welder is essentially the same as in the backhand method. The main flame is directed more on the rod and less on the vee, while the two small preheating flames prepare the surface so that complete fusion may be more quickly attained. The motion of the rod and blowpipe are a straight back and forward linear motion. The surface only of the vee is melted, to a depth of about 1/64 inch, and with proper rod manipulation the correct joint is attained.

The multiflame welder does not yet show any new economies on pipe up to six inches, but on the larger sizes savings of more than 25 per cent in rods and gases, and about one-third better welding time over backhand welding are effected.

With the adoption of welding for pipe line construction came the need of a machine for cutting out collars and plain-ending pipe, with the proper bevel for welding. In about 1924 such a machine was developed by N. E. Wagner. It has since been much improved. This first machine was split and could be clamped on the pipe. The torch carrier held one or two special short length cutting torches, set at the correct angle, and was rotated around the pipe through pinion gears. When both torches were used, a collar could be cut out at one setting. Or one torch could be used to prepare the end of a joint. Several ingenious machines have been designed in the last few years.

In addition to purely pipe line construction, there are innumerable applications of welding in maintenance and repairs of lines and equipment. In general, these repair methods have been covered very ably by special articles in the trade journals, and especially in several articles in The Oil and Gas Journal, by William G. Heltzel.

The use of bronze welding in coupling cast iron pipe has been very satisfactory. Bronze welding is used extensively in repairs of broken castings, such as engine heads, pump and engine frames, gears and pulleys.

Oxwelding is also used extensively in application of hard surfacing material to bearing surfaces, cutting tools, etc.

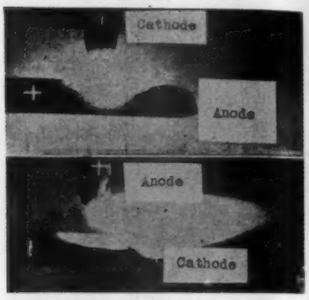
The history of arcwelding has been very much the same as that of oxwelding. The problems have been essentially along same lines, particularly in regard to chemistry and metallurgy. Of course, the development of welding equipment has been a special problem, and a bigger problem than that associated with oxwelding equipment.

Basic Phenomena

The basic phenomena underlying direct current arcwelding with metallic electrodes have been very little understood until within the past several years. The general conception has been that the "arc generated the heat" sufficiently to melt the rod and base. But the basics of how the arc generated the heat, and how the melted rod was deposited had to be thoroughly explored before it was possible to arrive at the solutions for arcwelding problems. A very clear definition of these phenomena is given in a paper by Robert Notvest at the Welding Conference at Purdue University in December, 1933, and appearing in "Welding," beginning in December, 1933, extracts of which are herewith quoted:

"Over 98 per cent of commercial arc welding today is done with direct current, therefore the author shall confine himself to describing the electro-dynamic characteristics of the direct-current arc which is the tool by which fusion metal is produced. The direct-current welding arc is the gaseous conductor for the movement of electrons and ions. Electrons are the smallest possible particles of electricity out of which the entire universe and all the matter therein is built up. In arc welding when the wire touches the work almost instantly through contact resistance sufficient heat is developed, especially on the negative pole (cathode), that electrons are ejected at tremendous speed, attracted by and traveling toward the positive pole or anode. As soon as even the smallest air gap is established, the velocity of such ejected electrons is increased to a value of one-fifth or one-third of that of light, namely 186,000 miles per second. These electrons collide and shatter some of the air molecules in their path, thereby increasing in turn the electronic bombardment of the anode. This moving or kinetic energy of such electron bombardment is transferred into heat, liquefying a pool of molten metal on the anode which may reach a temperature of 4,000° C. This heat is therefore produced mechanically, not through internal resistance with which the metal opposes the flow of current.

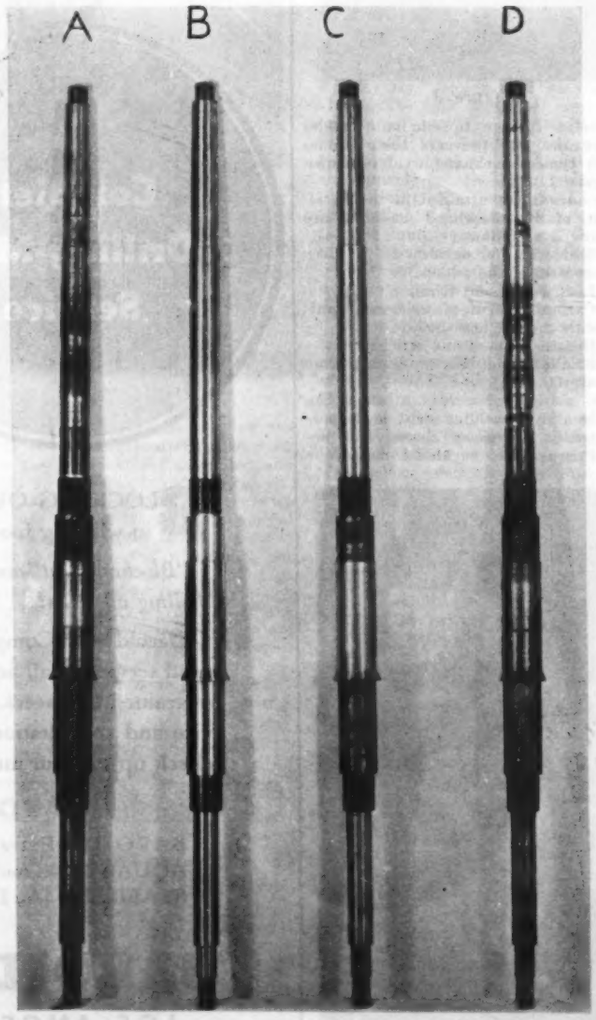
Figure 5



(Above) The moving cathode spot enables the free movement of the arc itself. (Below) Moving the anode only forces the electrons emitted from the cathode to travel in a circular path. A large arc flame with higher arc voltage quickly causes extinction of the arc

"This bombardment of electrons which shattered gas molecules in the air gap, as well as metal molecules, creates atom fragments with a positive charge, the so-called ions, which are repulsed from the anode and attracted by the cathode. While the mass of the ions is far greater than that of the electrons, their velocity is very much smaller. The collision of ions with the surface of the cathode therefore cannot liberate as much heat as the bombardment of the electrons on the anode. Therefore 70 to 75 per cent of the thermal energy on an electric arc is liberated on the positive pole or anode. The area of incandescence on the positive pole is far greater than that on the negative pole. This, however, is sufficient to emit electrons. The continuation of the direct-current arc depends upon the maintenance of an incandescent cathode spot, emitting electrons. The conductivity of the air gap depends solely upon the numbers of electrons and ions present. Certain substances, notably the oxides and carbonates of the alkali metals, have a high thermionic emission effect, that is, liberate electrons at relatively low temperature compared with iron and are therefore freely used in most welding wire coatings." See Figure 5.

Once this ionized path is set up and the arc established, the electrode begins to melt and form globules. These globules then follow this arc path to the object being welded. Each time a globule of molten metal crosses the space, the



High speed centrifugal pump shafts subject to sand cutting. B shows a new shaft and D shows the shaft after about two months' service. C is worn shaft after being rebuilt by metal spray with high carbon steel, and A is same shaft after 6 months' service

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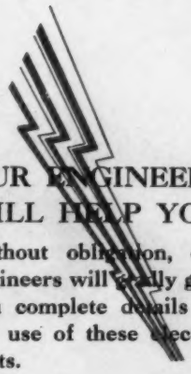

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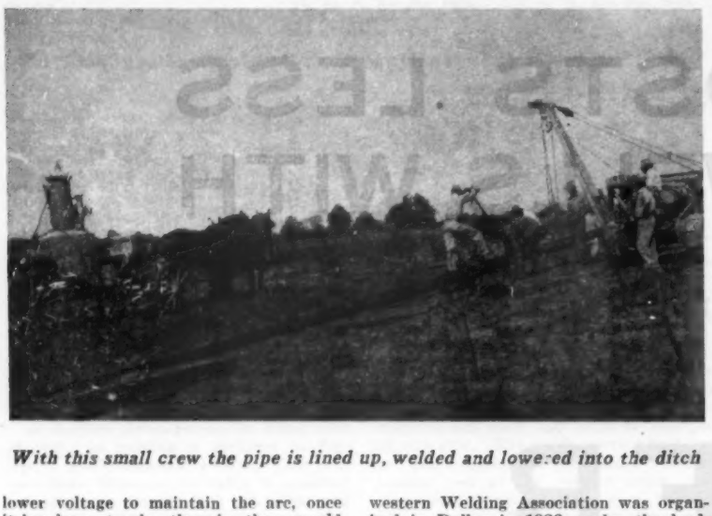
voltage drops close to zero, the arc is extinguished, and is instantly re-established, if the distance is not too great.

The arc chooses the shortest path from the electrode to the base metal. The ionization of this path results in a lower voltage to maintain the arc, once it has been struck, otherwise there would be an excess flow of current. This arc is also subject to magnetic influences, which makes it rather difficult to direct, in bare metal electrodes. Therefore, much research has been required to design welding equipment amenable to proper procedure control.



With this small crew the pipe is lined up, welded and lowered into the ditch

Big Problem

The big problem in development of arc-welding has been elimination of oxides and nitrides, which resulted in brittle welds. It can be readily realized from the study of the fundamentals that the gases in the oxwelding process helped to exclude the oxygen from contact with the molten metals, and that the unprotected arcweld is much more subjected to these detriments.

In the pipe line industry, the South-western Welding Association was organized in Dallas in 1926, under the leadership of W. Mike Murphy, for the purpose of studying and developing arc-welding applications, improvement, and usage. It was then apparent that some method of shielding the arc from the action of nitrogen and oxygen must be devised, in order to produce a satisfactory weld for pipe joints. It was through the efforts of certain members of this organization that the double bell and chill ring were developed.

The first arcwelded line of any great length was 40 miles of bell and spigot, 7-inch O.D. gas line laid near Monroe, La., in 1928. The same year this method was used on an 8-inch line for the Texas Pipe Line Co. from San Augustine to Corsicana, Tex. Also about the same time, Magnolia arcwelded some 65 miles of 12-inch gas line between Monroe and Richland Parish Field, using the welding dam. In 1929, the Texas-Empire 12-inch oil line, bell and spigot joint, was arcwelded with bare electrodes, from Cushing to East Chicago.

These early joints by arcwelding were far from satisfactory, both from the nature of the joint and from the metallurgical aspect. The bell and spigot joints and the welding dam joints subjected the weld metal to shear, which is the most injurious of the three main stresses governing the strength of a welded joint. The use of the double bell and back-up, or copper chill ring, eliminated this weakness to a great extent. But the deposited weld metal from bare electrodes was still a big problem.

As early as 1914, investigations were made toward shielding the arc from the air. In 1927, a cellulose wrapped rod was patented in New Jersey, and was a great step forward. From 1929 to present, no less than 50 United States and foreign patents have been granted covering shielded welding rods. All of these different shielding methods in effect are for the purpose of excluding air, and of giving closer directional control to the arc.

Naturally, the newer rods included metallurgical changes and alloys to secure welds of character and strength comparable with the advances in pipe specifications. We now have welding rods designed to serve for most any purpose.

The first shielded-arc line of any size

Welding 24-inch intake header at compressor station

Protection Supreme

Thousands of miles of pipe line have been safe from rust for years under coatings of NO-OX-ID. The full range of soil conditions and stresses have been overcome. NO-OX-ID Master Coat, application of which is here illustrated on the last section of the gas line from Amarillo to Chicago, deserves investigation because of its economy and long lived reliability.

Inquire also regarding Dearborn's reduced cost methods of reconditioning and protecting corroded and pitted lines.

Data, recommendations and estimates submitted gladly.

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was 32 miles of 20-inch gas line for Cities Service in 1930, in Kansas, without expansion joints or couplings between welded sections.

Up until 1933, the bell and spigot, the bell and welding dam, and the double bell and back-up ring, and the straight copper chill ring, and the cellulose back-up ring were the accepted types for arc-welded points. In 1933, 227 miles of 8-inch oil line for Phillips Petroleum Co. was laid from Oklahoma City to Burlington, Kans., without chill rings. This was the first butt-welded line of any size to be thus welded.

With the newer shielded rods the procedure control is quite different from the bare metallic rod, and the speed is 75 per cent faster. The following tabulation shows present-day time for making rolling welds:

8-inch	6 welds per hour
10-inch	4.5 welds per hour
12-inch	4 welds per hour
14-inch	3 welds per hour
18-inch	2.5 welds per hour
20-inch	2 welds per hour
24-inch	1.6 to 2 welds per hour

The usual procedure in sizes up to 14-inch pipe is to use three beads, without the chill ring:

First bead	Second bead	Finish bead
3/16" rod	¼" rod	5/16" rod
200 amps	300 amps	400 amps
40 volts	40 volts	60 volts

For sizes over 14-inch, the chill ring is necessary, especially with thin-walled pipe on account of distortion. Where back-up ring is used, only two beads are required:

First bead	Finish bead
¼" to 5/16" rod (⅛" for short bevel)	⅜" rod
300-400 amps	400-600 amps
40 volts	60 volts

It is necessary to de-scale each bead, which is done with a simple chisel-like scraping tool.

Bell hole welds require about three times the time of a roll weld, and ⅜-inch rod is used for all beads.

Tanks

Arcwelding has been used for over 10 years in tank construction. Roofs and bottoms were welded first by simple fillet welds on the lapped sheets. Later, some large tanks were constructed with lapped fillet welds on the shell, with a few rivets for holding the sheets in place before welding. These were not satisfactory.

With the advent of the improved shielded rods, arcwelding has rapidly supplanted riveting in tank construction. Both the lap-weld and butt-weld joints are used, with the preference now leaning to all butt-weld. Generally speaking, welded tanks eliminate punching costs in the shop and give tighter joints. In heavy construction, buttwelded joints eliminate the necessity of the large butt strap, with a big saving in weight.

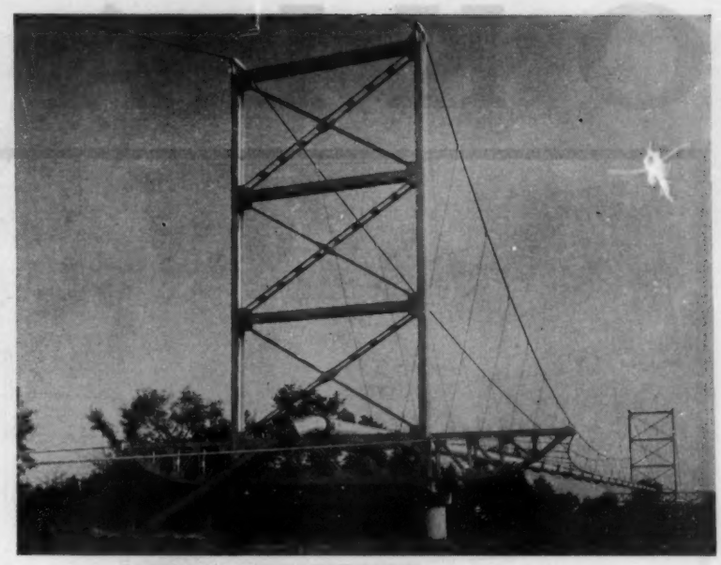
Metal Spraying

The spraying of molten metal on a surface is not, strictly speaking, welding. However, it uses essentially the same materials and equipment as oxwelding, and is finding special applications in the pipe line industry, under general welding terminology.

Applications

Some of the applications of metal spraying in the pipe line industry:

Article	Type	Purpose
Combustion chambers	Aluminum	Heat dissipation
Exhaust manifolds	Aluminum	Corrosion
Water jackets	Low carbon steel	Repair cracks
	Zinc	
Valve chambers	Bronze	Repair
Centrifugal pump shafts	High carbon steel	Rebuild
	Stainless steel	Corrosion
Piston rods	Low carbon steel	Repair
Pump plungers	Steel bronze	Repair
	Stainless steel	Corrosion
Pistons	Low carbon steel	Rebuild
	Tin, aluminum, copper	
Crankshafts	Nickel or H.C. steel	Rebuild
Tanks	Aluminum, Zinc, lead	Corrosion



Bridge for carrying natural gas trunk pipe line over river

Acknowledgments: It is a very difficult matter to cover such a broad assignment except in a general way. The writer is indebted to the following for general information and personal suggestions:

H. C. Price, Linde Air Products Co., Air Reduction Sales Co., W. Mike Murphy, Robert Notvest, General Metallizing Co., Lincoln Electric Co., Welding, Chicago Bridge & Iron Works, American Brass Co., International Metallizing Association.

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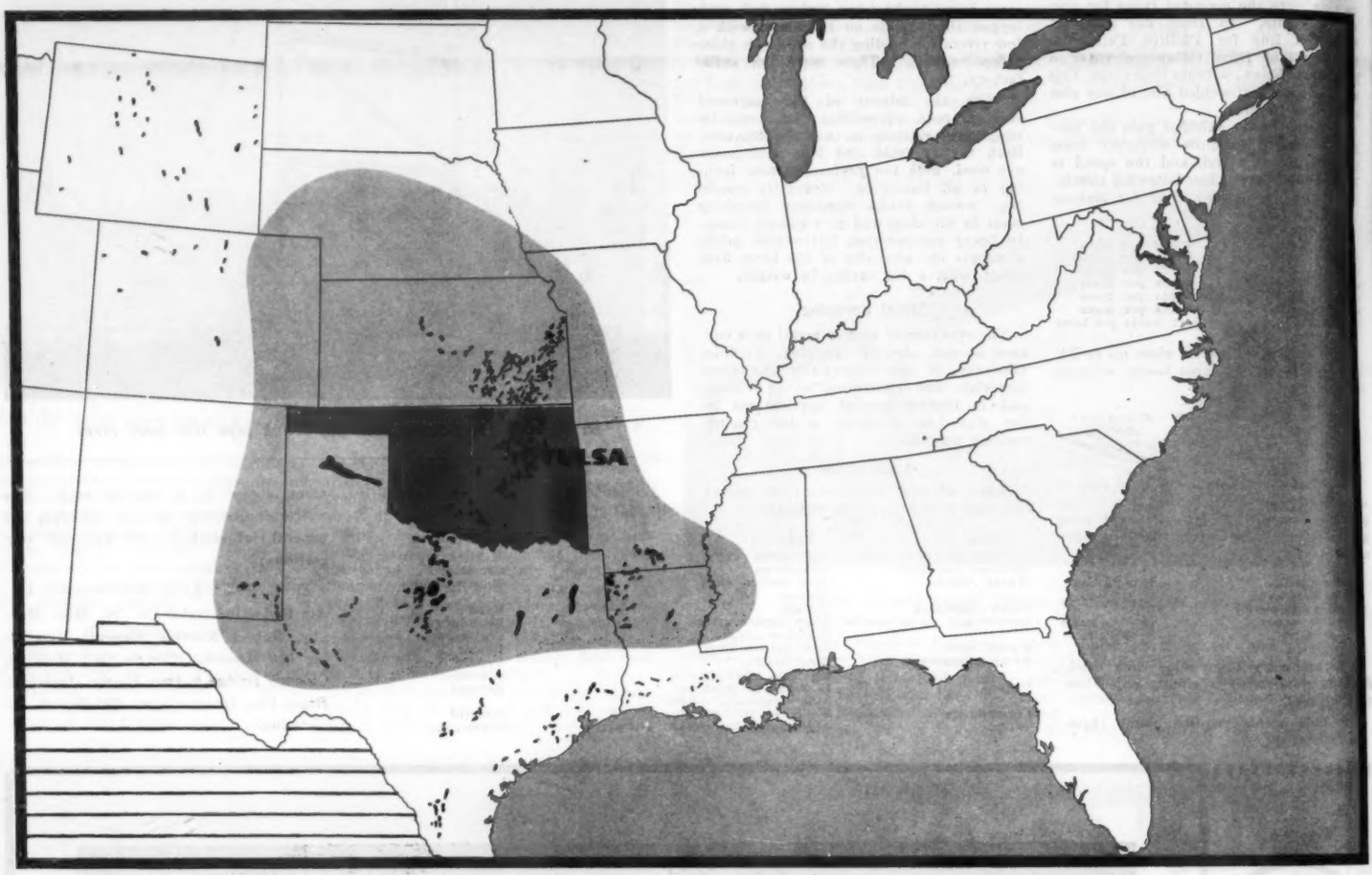

Red Shading Indicates Mid-Continent Oil Area.

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In 1907—with the development of the Glenn Pool—Oklahoma forged into the lead, among the states, as an oil producer.

In the 26 years that have since elapsed, Oklahoma, though less than half as large as California and hardly more than one-fourth the size of Texas, has led in oil production in 9 other years; California has led in 11 years; Texas in 6 years.

This points to Oklahoma, area considered, as unquestionably *the greatest oil producing territory in the world.*

Yet only a beginning has been made in Oklahoma oil production. The "field of the hour", today, is a new Oklahoma field, the Fitts Pool, producing from several sands and with big possibilities. Again, geologists state that the Oklahoma City and Wentz pools are outposts that bring in an entirely new oil province that stretches entirely across Oklahoma, and that this area "now resembles the Los Angeles Basin, *but is much larger in size.*" Only the surface has been scratched in Oklahoma oil.

Tulsa became the World's Oil Capital because she lies at the center of world oil production. Not only is she located at the hub of Oklahoma production, but she is also at the hub of Mid-Continent production—which means 63% of the nation's —40% of the world's—oil.

This strategic location has brought to Tulsa the headquarters offices of 44 major and 550 smaller oil companies—more than are found in all other centers of the Southwest combined. Every year additional important oil companies move their offices to Tulsa.

These companies, from Tulsa as headquarters, control production, pipe line and refining operations throughout the Mid-Continent, Gulf Coast and Rocky Mountain areas. Their presence here has made Tulsa the world's major center of oil equipment purchases, expenditures in this line by Tulsa oil companies totalling, in a normal year, $400,000,000.

The maker of oil equipment who has no sales representation in Tulsa is overlooking a major sales opportunity. An inquiry addressed to the Tulsa Chamber of Commerce will receive prompt and careful attention.

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Pipe cleaning machines mounted on stationary bases in yard where reconditioning is done

Reconditioning of Pipe Lines Is Fast Becoming of Primary Importance

By E. C. ROLFS
Crutcher-Rolfs-Cummings, Inc.

The maintenance of underground pipe is fast becoming of primary importance to most pipe line companies. Those companies who have laid their lines with no protection against corrosion, with inadequate protection, or with improperly applied protection (viewed in the light of today's knowledge on the subject), are each year experiencing more serious troubles due to exterior soil pitting. Despite the fact most of these lines were laid in conformity with engineering practices and principles believed at the time to be sound, it remains true if these lines are to be continued in use, repairs or reconditioning must be undertaken. Obviously, shrewd operators will do this essential reconditioning work before the pipe in their lines is too badly corroded, or too far gone to be profitably salvaged.

There are approximately 200,000 miles of underground steel pipe embraced in the pipe line systems in the United States. Between 85 and 90 per cent of this pipe is sound, but 10 to 15 per cent is badly corroded and must be reconditioned if the lines are to be continued in profitable operation.

Aware of the size of the problem, pipe line operating companies are gradually formulating definite policies with reference to reconditioning work. Much urgently needed reconditioning work, postponed because of cost, will likely be undertaken in the near future due to the development of mechanical equipment that permits of rapid rehabilitation of old lines at comparatively low cost. In some phases there is still room for considerable improvement of methods and equipment looking toward lower costs, but aggressive manufacturers eager to find new markets are fast developing the needed equipment.

First Objective

In the actual reconditioning program, the first objective is to locate and "flag" the line within the right of way. Most operators believe they know the exact location of their lines, but this is not always true. In many older lines, or lines through cultivated areas, the face of the ditch has been obliterated and the line must be definitely located before work may begin. In the past, the hand probing bar has been the crude instrument used in this work. Its place is rapidly being taken over by the underground pipe locator. The apparatus utilizes the principle of radio, and easily locates and traces any buried pipe line. The cost, naturally, is very considerably less than the use of the probing bar or digging methods.

The locator consists of a high frequency transmitter and a specially designed portable radio receiver operating with a selective directional loop antenna, which latter is carried in the hand of the operator. The pipe line and connections are "excited" by the transmitter, which transmits high frequency pulsations between two grounded points. The signal is heard by the operator when he is directly over the line, being picked up by the loop antenna and in turn detected and amplified by the radio receiver. One company has estimated that this instrument, operated by two men, will locate 10 to 20 times as much pipe per day (in "flagging" pipe to be uncovered) as the probing method. The instrument has also been found of excellent value in locating unauthorized connections to pipe lines. One major pipe line company, suspecting such a tap on one of its gasoline lines, located the offending tap within three hours searching.

After the line has been located and flagged, the next job is to determine the condition of the pipe as regards corrosion, pit holes, etc. This is generally accomplished by digging "bell holes" at various intervals especially where a record of leaks, clamps and other repairs indicate severe corrosion and deterioration. Careful inspection of the pipe in the bell hole and the measurement of the depth of the pits, together with their area, is of very great importance in determining the necessary reconditioning procedure. An exceedingly useful instrument for the measurement of pits has been developed by J. C. Stirling of Stanolind Pipe Line Co.

Speedy in Uncovering

If it is decided, after careful inspection of the pipe, to recondition certain lengths or loops, the next step is to uncover it. There is need of much improvement in this phase, both as to speed and in the direction of lowering the cost of the work per foot. Present methods employed embrace the use of ditching machines, plows, shovel ditchers and hand shovel gangs. If the job is short in length, hand shovel gangs are probably the most practical, while longer lengths of pipe warrant the use of some type of ditching machinery equipment. The Sinclair-Prairie company is experimenting with a small tractor shovel for uncovering their lines. It is understood results to date have indicated a substantial saving. A side boom unit for handling pipe and doing backfill work is being added, so one unit will ditch, raise and lower pipe and backfill the ditch. This unit may also be mounted on rubber-tired wheels and driven under its own power over highways to the next reconditioning job.

Pipe coating machine

After the pipe has been uncovered and either raised off bottom of the ditch, or completely out of the ditch and placed on skids, as conditions dictate, the pipe is ready to be cleaned. Hand cleaning with scrapers, files and steel brushes, having proved expensive and inadequate, appears to have given away almost entirely in favor of mechanical pipe cleaning machines. For short lengths of pipe (up to 400 or 500 feet) a hand-operated cleaning machine is available which does the work very efficiently and at lower cost. This machine employs approximately 200 fine-pointed, hardened cutter wheels which dig into the scale and rust and dislodge it. It is not, however, adapted for cleaning off old coatings.

Where considerable lengths of pipe are to be cleaned at a central yard, two methods are available. One is the sand or grit blasting method, which, though effective, is comparatively quite expensive. The other method is the use of a power driven pipe cleaning machine mounted on a stationary base, through which the pipe to be cleaned is automatically propelled. This method involves a lower initial investment in equipment, produces work equally satisfactory and does it with equal or greater speed. It has the further decided advantage of equipping the pipe line operator with a machine quickly convertible for traveling work on made-up lines to be cleaned over the ditch. One major pipe line company, on a recent job, maintained accurate records of overhead, depreciation, wearing parts, labor, handling costs, etc., and reported a cost of 2 cents per foot for cleaning 8-inch pipe. These machines are available for cleaning pipe from 3 inches to 24 inches in diameter and will, in addition to removing rust and scale, also remove old coatings by means of scraper knives which may be attached. It has not proved possible for these machines to clean to the bottom of deep pits, but in all instances it is the practice to weld or patch these anyhow, to insure a sound line.

Work on Line in Use

Plans for reconditioning work will vary considerably depending upon local circumstances. To date, most reconditioning work has been done while the line remained in use, work being done either in the ditch or above the ditch. Gas companies usually employ the "loop" method, laying a new loop 1 to 5 miles parallel to the line to be reconditioned. When the new loop has been "cut in,"

the old pipe is taken up, hauled to a central reconditioning yard, cleaned, repaired by welding after very careful inspection and grading, and hauled back to the line to be used in laying a second loop parallel to another section being reconditioned.

The Stanolind Pipe Line Co. recently completed a program of modernization and reconditioning that may become the basis of a common practice. The company laid an entirely new 12-inch welded line to replace three 8-inch old, screw collar lines. The old pipe was cleaned in centrally located yards, the collars cut out and the pipe graded according to depth of pits. This old pipe was then relaid in completely welded lines to the new fields, the best pipe being laid where the highest pumping pressures were contemplated. The project was made possible because of the company's need for pipe to lay to new fields. It would seem entirely feasible for other operating pipe line companies to follow this example when pipe is required for lines

Hand operated pipe cleaning machine

to new fields. The procedure gives the companies an opportunity to eliminate screw collar lines (which have always been a prolific source of trouble due to leaks), and to modernize their systems. Standard Oil Co. of California and the Lone Star Gas Co. are both now taking up old pipe, reconditioning in centrally located yards, and relaying in complete welded lines to new fields. Many old lines, not now in operation, should be taken up, cleaned and reconditioned, and stored ready for immediate use in new lines, or for disposition by sale. Corrosion or deterioration in a yard is considerably less than in the ground. Also, generally speaking, the taxes are less.

After pipe has been cleaned, the pit gauge is exceedingly handy in measuring the depth of pits to determine which joint should be welded or patched, and which should go untouched. Most companies have tables of pit depths as standards for the guidance of the reconditioning crew. The common procedure today is to cut out old screw collars, or at least to weld them at each end. The Humble Pipe Line Co. has developed a practice of welding a split ring on each end of the collar as described in June 21, 1934, issue of The Oil and Gas Journal. Both acetylene and electric welding have advanced to such a degree that there is no doubt as to the strength of the welds, and if sufficient slack is relayed in the line there is little trouble encountered from contraction.

Coating the Pipe

After the pipe has been properly patched and the deep pits welded, the common practice is to apply a protective coating to ward off corrosion. Some companies do not apply protective coatings, but since the major part of the work has been done up to this point, and the bulk of the expense incurred, it seems most unwise not to add protection against future corrosion. In this connection, it is safe to say that most of the failures of protective materials in the past (which have no doubt discouraged their use in some quarters) have been due to two causes; first, improper application, and second, insufficient thickness of coating materials.

The A.P.I and A.G.A. corrosion tests show that in general the thicker coatings stand up much better than thin coatings. Unless a company is prepared to spend sufficient money, and to exercise exacting care in applying protective materials correctly, and in sufficient thickness, it is best that no coating at all be used.

If bituminous coating is used, the line must be primed. Usually this is done by the hand sling or brushing method, and it has been definitely determined that two coats of primer result in a much better bond between the primer and the following coat than a single coat of primer provides. The primer, of course, must be of the proper consistency, neither too thick nor too thin, and by no means should any primer be applied to dirty pipe. The logical time to prime pipe is just before coating, wrapping and placing in ditch. If the primer is left exposed for several weeks it becomes dead and must be reprimed. Furthermore, exposed pipe which has been primed accumulates dust and dirt, which substantially reduces the bond between primer and coating. Some companies that have cleaned and reconditioned pipe in central yards do not prime it at that point, but run a cleaning machine over the pipe, again after it has been welded into the new line, before priming. This practice insures cleaning of all welds, also.

The conventional method of applying hot bituminous coatings with "granny rags," invariably resulting in pinholes and holidays, in loss of coating in the ditch, in variation of thickness of coating, has, through its deficiencies, led to the development of coating machines. A mechanical coating machine which has approximately some 300 miles of practical field use has been developed. This machine applies a coating of uniform thickness, practically free from pinholes, and saves much of the coating previously lost in the ditch when "granny rags" were used. In addition, there is a saving in labor. The machine is easily pushed along the pipe by hand at a speed as high as a mile per hour.

Detecting Device

After the coating has been applied, a number of companies are now using an instrument known as a "holiday detector" for determining pin holes or bare spots in the coating. These spots are usually patched with a hand daubing brush. The Humble Pipe Line Co. has developed a holiday detector, which is a light wood box containing a storage battery and an electrical coil with vibrating point very similar to the coils used in the old Model "T" Ford automobiles. The box is mounted on wheels, and attached to it is a metal ring fitted with fine wire fingers which encircle the pipe. As the outfit is moved along the coated pipe, a spark is set up when a holiday in the coating is passed over. The Humble Pipe Line Co.'s detector was described in June 21, 1934, issue of The Oil and Gas Journal.

The trend of practice appears to be toward more general wrapping of coated pipe, as it has been found that wrapped coatings, where there is soil stress, stand up much better than unwrapped coatings. It has also been found that about 90 per cent of soils, particularly in the Mid-Continent and western areas, do have considerable soil stress. A number of materials have been tried for wrapping pipe, but the wrapper still most generally used is asbestos felt. Felt may be applied either by hand as a spiral wrapping, or may be applied in longitudinal sheets. These methods, however, are costly and it is difficult to obtain a good finished job. The most satisfactory method of applying felt in the field is through the use of a wrapping machine. This machine applies the felt very tightly, and lowers the cost of application very considerably. Field wrapping machines are available in three types, viz., (1) the rotary machine for speed in cross country work; (2) the ditch type machine where small clearance between pipe and ground is governing factor, and (3) the saddle type machine for use when large diameter pipe is rotated for coating purposes. The rotary and ditch types are turned by hand, and one machine can easily wrap from 1 to 2 miles of pipe per day. The saddle type merely rests on top of the pipe and as the pipe is rotated travels from one end to the other.

A number of companies make a practice of applying an additional coat of bitumen after the pipe has been wrapped with felt. In some instances they have added a second wrapping where soil conditions are very bad. The consensus of opinion is that a coating and wrapping of not less than one-eighth inch in thickness should be used under medium corrosive conditions, and a coating and wrapping of from one-fourth to one-half inch in thickness where the soil conditions are very bad.

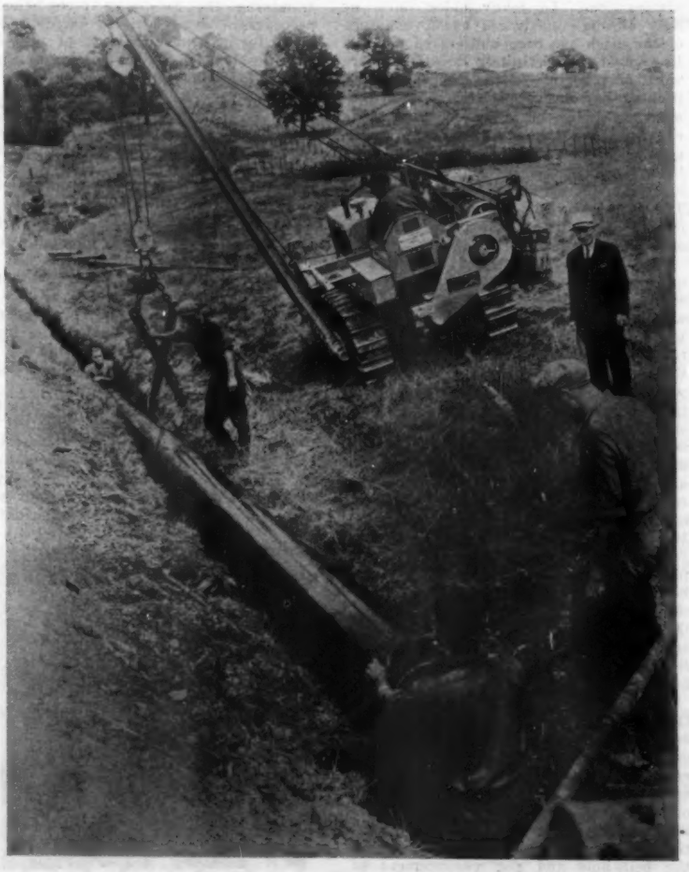
Ditch type wrapping machine

After the pipe has been coated and wrapped, it is extremely important that it be handled without damage to the coating as it is lowered into the ditch. A cradle, consisting of three rollers swung in a steel frame and equipped for suspension from a tractor side-boom, has proved very satisfactory for this purpose. A wide canvas or belt sling is also very desirable, as it inflicts no injury whatever to the coated pipe. The cradle on a tractor side-boom raises the pipe for the application of coating and wrapping. As the tractor drives along the coated and wrapped pipe is automatically lowered into the ditch without further handling. Slack loops are "crocked up" in the ditch and lowered in the cool of the early morning. After the pipe is lowered into the ditch, it is recoverable by the standard tractor backfilling methods, or, if the job is short, by a hand shovel gang.

Through the development and perfection of mechanical equipment for performing almost every operation involved in reconditioning pipe lines, it is possible for the operators to obtain a much better reconditioning job at a very greatly reduced cost per foot as compared to hand methods formerly used. There is still need for improvement in equipment for uncovering pipe, and with manufacturers awake to this need it is likely machines will be developtd to handle this phase of the work as efficiently and economically as other types of machines handle the cleaning, coating and wrapping work.

Pipe line construction has advanced very materially in the past 10 years due to engineering study of the problems involved, to "cut-and-try" experiments in the field, and to an extent greater than they are sometimes credited with to the efforts of men who have developed equipment to meet the needs of the pipe line trade.

There should be, and there will be, a number of other improvements made in reconditioning methods, due to further study of reconditioning work. Better work at lower cost is the slogan.



Bringing gas to home and industry in Pennsylvania

Reproduction of the micrograph above shows the interlocking of the flakes of the internal re-inforcement used by Barrett. By laminating with the waterproofing agent, they give Barrett Pipe Line Enamels unusual toughness and resistance to soil stresses.

For pipe of large diameter, The Barrett Company will furnish equipment required to revolve pipe and spread enamel.

MAXIMUM PROTECTION at lowest cost per year . . . .

Barrett Pipe Line Enamels successfully resist the destructive action of water, soil acids, alkalis, stray electric currents, and other corrosive agencies.

Barrett application specifications, developed through years of field experience, provide rules for correct field applications.

The combination—Barrett Pipe Line Enamels applied according to Barrett Application Specifications—is designed to meet all service conditions and assure maximum protection at the lowest cost per year. Phone, write or wire for information.

THE BARRETT COMPANY, 40 RECTOR STREET, NEW YORK, N. Y.

Barrett Specification

PIPE LINE ENAMELS

Acidize not by "guess" but by DOWELL!

3,795 wells have been acidized by *Dowell*.

Why?

Because those in charge were unwilling to risk their properties to guess methods employed by "acid dumpers."

They recognized Dowell as an authority—for Dowell is a subsidiary of The Dow Chemical Company, known as a leader and pioneer in chemical research and production.

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CHATHAM, ONTARIO

Natural Gas Pipe Line Extensions Handicapped by Waste and Taxes

By ANDREW M. ROWLEY

Natural gas pipe line systems have been constructed and expanded in the United States until at the present time natural gas either is in or practically at the gateway of every metropolitan area east of the Rocky Mountains, in addition to serving many large centers on the Pacific Coast. Aside from its important use in hundreds of thousands of households throughout the nation, natural gas now supplies five or six times the energy of the entire electric light and power industry.

In the field of the use of natural gas as fuel for the generation of electric energy, this use has been increased more than 160 per cent in 11 years, pipe lines being constructed with this service as a prime motive. An illustration of this is the utilization of natural gas by the Southern California Edison Co. In this instance natural gas is transported a distance of 213 miles for use as fuel in steam generation, thereby displacing hydro power as a means of producing electric energy.

While there has been an especially extensive growth of natural gas pipe lines during recent years, many communities and industries have been deprived of the benefit of Nature's wonder fuel by three vital factors that are threatening the welfare of the natural gas industry and its service to millions of people throughout the United States. These factors are the unwarranted, inexcusable and tragic waste of natural gas in the fields where it is produced; inimical and discriminatory legislation; and the piling on the industry of almost confiscatory taxation.

Large Investment in Pipe Lines

During the period say from 1927 up to and including 1931 several hundred million dollars was expended in the United States for the construction of natural gas pipe line systems. Cities and towns throughout the Southwest, Middle and Central West and other sections of the country were connected by large-diameter pipe lines with producing fields and this cheap, clean and efficient fuel made available for domestic and industrial uses.

Many persons have believed the slowing down of natural gas pipe line construction in the past year or two has been due to the business depression. It is true the depression had some effect but probably a more important factor has been the attitude of state governments and officials. Conservation laws not only have been ignored but legislation has been placed on the statute books or rulings and regulations issued by state conservation commissions and officials which have had the effect of actually encouraging further waste.

The factor of paramount importance in deciding whether to construct a natural gas pipe line is the extent of the natural gas field or reservoir and the quantity of natural gas which may be recovered from the field. The pipe line is of value only so long as it can transport its capacity of natural gas and any untoward or rapid depletion of a natural gas field or reservoir simply hastens the time when the natural gas pipe line would be rendered useless and of no value except as salvage.

Of secondary consideration to this prime requisite are the markets for the pipe line. The value of natural gas is so well known but little education is necessary in most communities to have those communities petition for natural gas service. Of course there are places where local or even state conditions are such opposition to extension of natural gas service arises. In this category is the opposition of the coal industry and movements against natural gas installations in communities where coal mining is a major industry.

Many Markets Available

But the fact remains there are more markets readily available for natural gas service than existing, proven natural gas fields can supply. A glance at the map of natural gas trunk pipe lines in this issue will show the many cities and towns in the vast territory throughout the Middle West which can be supplied with natural gas from existing pipe lines by comparatively short extensions from these lines. The same is true in the eastern section of the United States where the great markets of New York, Philadelphia and other large cities and industrial centers have natural gas at their doorways but are not, as yet, being supplied with this fuel.

Most of the large natural gas pipe line systems in the United States are owned by well-financed companies able to extend their facilities. The question naturally arises, then why do these pipe line companies not construct extensions to existing lines and serve more cities and towns?

The answer is in the three factors previously mentioned—waste of natural gas in the fields, which waste is depleting the available supply; heavy and almost confiscatory taxes; and discrimi-

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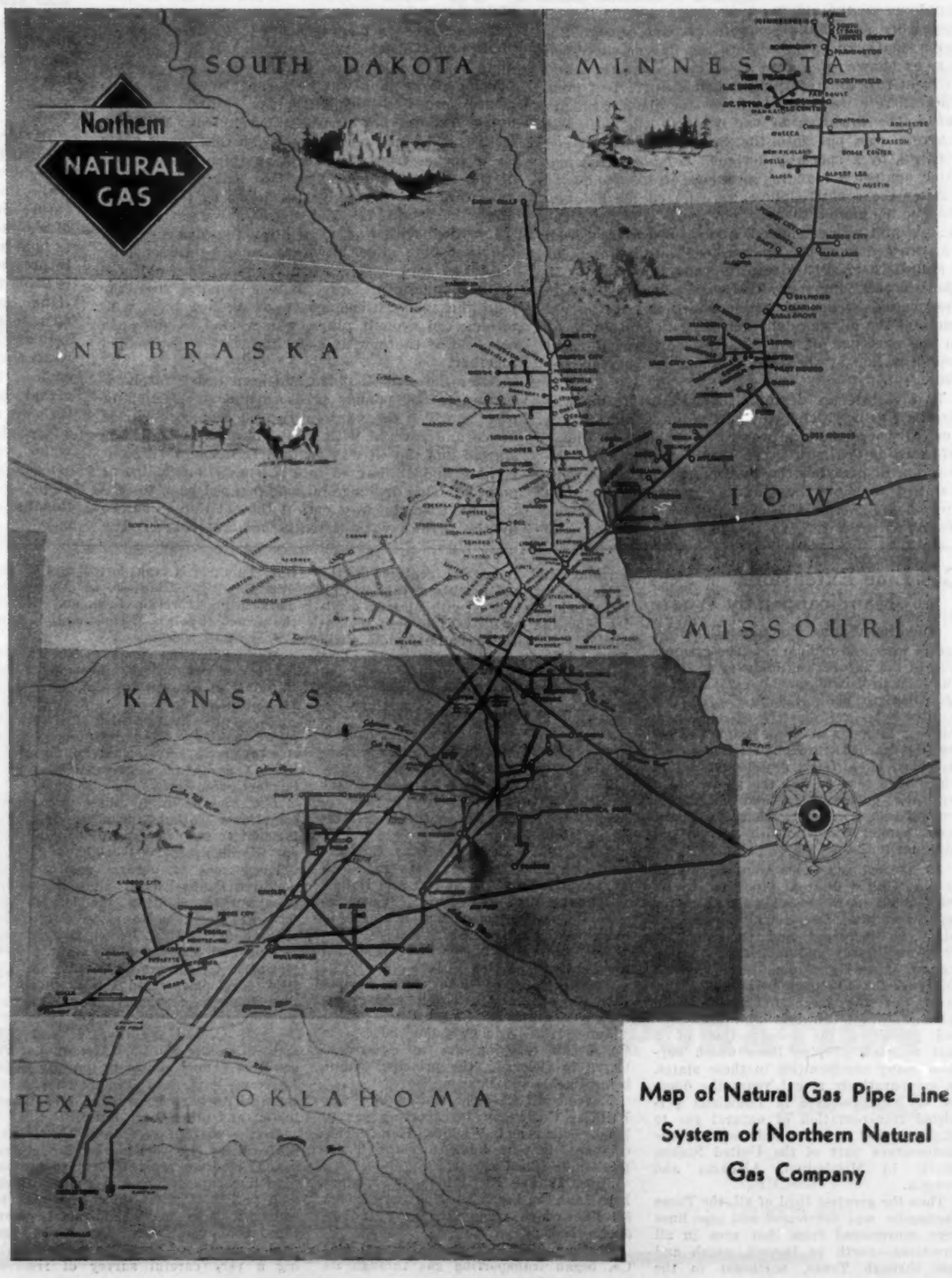


Map of Natural Gas Pipe Line System of Northern Natural Gas Company

Important Developments Show Progress in Pipe Line Operation

(Continued from Page 48)

eral Wells was about one-half mile away. There was about 2,000 barrels of drainage in the line. The soil was of a sandy texture and was badly cracked by the drought. These conditions would not permit the use of draining the oil into an open pit or the impounding of the oil in the creek because the resulting damages might have been enormous.

New Method Is Employed

To meet this condition the Stanolind Pipe Line Co. tried out for the first time a method which it had been developing for two years to meet such conditions. The general plan of the job near Minarel Wells is shown in Figure 3. The first step was the boring of a new crossing under the highway, inserting the casing and laying about 500 feet of new 10-inch seamless pipe about 10 feet away and parallel with the section of the line which was to be abandoned. This new line was welded and coated according to the company's regular practice.

After the new line was ready to be tied in, a shutdown on the old line was obtained from the oil dispatcher and liquid concrete (1 part cement, 2½ parts sand) was pumped into the line at the creek sag, as shown in Figure 4, at two separate points to form two concrete plugs, each about 7 feet long. The concrete was allowed to set for about 20 hours before the drainage of the oil was started. The concrete was put into the line, which was filled with oil, by a specially designed hand-operated machine against a standing pressure of 100 pounds.

After the concrete plugs were tested for holding, the suction and discharge piping to and from the pick-up unit was connected. About 1,000 barrels of oil was drained from the line west of the plug at point B and discharged back into the same line at point E. The concrete plug served as a closed valve between the suction and discharge connections on the old line and the oil was delivered back to Station No. 1 on the east end of the line. The oil was drained from the line at the rate of about 200 barrels per hour.

To facilitate the draining of the oil, the line was given air at the high point on the line about 6 miles west of where the pipe was to be replaced. To keep informed as to the pressure conditions and as to the progress in draining the line, pressure gauges were installed to show the standing pressure, the pressure on the suction side of the pump, as well as the discharge pressure. As the line was drained, the suction pressure dropped from a standing pressure of about 100 pounds to a vacuum. The discharge pumping pressure was about 160 pounds in pumping the drainage oil in both directions. About five hours were required to drain the oil from the west end of the line.

The direction of the drainage and the pumpings from the pick-up pump are shown by the arrows on the plan. The arrows with the numeral 1 show the direction of drainage from the west end of the line and the arrows with the numeral 2 indicate the direction of drainage from the east end of the line.

After the west end of the line had been drained the old line was cut out and welded to the new section of line at point F.

During the first drainage operation in which the concrete plug was subjected to about 160 pounds pumping pressure, no leakage in the plug developed.

The next step in the plan was to drain the oil from the east end of the line and pump it back into the west end of the line and to Station No. 2. Reference to Figure 3 will show an asphalt plug near the open end of the line, point G, where the new and old line are to be welded together to complete the replacement.

Tests had been made previously to show that asphalt plugs, about 3 feet long, cast in 6, 8 and 10-inch pipe would hold against pressures of 300 pounds, if the plug was kept cold. With this experience, two 4-foot asphalt plugs (Standard of Indiana medium hard parolite) were cast in 7-foot lengths of 10-inch seamless pipe, so that there would be 18 inches from the end of the pipe to each face of the asphalt plug. These two lengths of 10-inch pipe were welded together as shown by the detailed insert in Figure 5. The space between the plugs was filled with water so that the movement of the first plug under pressure could be detected by the water replacement when the plug was subjected to the pumping pressure. It will be noted from the plan that the 14-foot length of 10-inch pipe, containing the asphalt plugs, was welded to the open east end of the new and old line were to be welded together.

After the asphalt plugs had been tested for holding up to 300 pounds pressure and the section of pipe in which the plugs were cast had been buried in ice and covered with sand, the pick-up unit was started and the oil was drained from the old line at point C and discharged into the new 10-inch line at point D. This drainage oil was pumped back to Station No. 2 on the west end of the old line as shown by the arrows with the attached numeral 2. The maximum pumping pressure was 160 pounds. The asphalt plug served as a closed valve on the end of the new line while the transfer of oil from the old line into the new line was being made. In fact, the company had made previous use of the concrete plug, but it was always necessary to use a valve in the line. The asphalt plug has eliminated the valve, which is undesirable in the line.

After the drainage of the east end of the line had been finished, the old line was cut and the new line was swung over into position and welded to the old line. The sand and ice were removed from the pipe containing the asphalt plugs and within about three hours the plug gave way under a standing oil pressure of about 100 pounds and atmospheric temperature of about 80° F.

It should be pointed out that this procedure involved a certain amount of risk on account of the pipe beyond the asphalt plugs being open while the oil was being transferred. A careful check was kept on the movement of the plugs which amounted to about one-quarter to one-half inch per hour. Under the pressure the face of the inspection plug next to the open end of the pipe formed a convex surface with slight cracks radiating from the center.

On account of keeping down the connection of heat to the asphalt plugs a bell hole electric weld was made where the new and old line was welded together at point G.

Holding Asphalt Plug

In view of the experience on this job it was decided that too much risk was involved in leaving the end of the pipe beyond the asphalt plugs open while the transfer of oil was being made and in the future the end of pipe will be threaded for the use of a blind flange through which studs will be fitted to hold a steel plate firmly against the asphalt plug to prevent any movement of the plugs while the oil is being transferred; of course, the steel plate, blind flange, and studs would be removed before the next operation, which is described below.

It has been decided also that instead of taking the risk of oil leakage through the plug while the open ends of the new and old line are being welded together, arrangements will be made for connecting the new and old line together at point G first with a specially designed right and left threaded nipple which will involve only a mechanical method, and after a tight mechanical joint has been made the nipple joints will be welded. Without these additional precautions the procedure is not recommended.

Gas Line Extensions Handicapped by Waste

(Continued from Preceding Page)

natory laws and ordinances. The greatest need of the natural gas industry today is an intensive, widespread campaign of education to show the people of this country who are directly affected how the best interests of these people are being disregarded through selfishness on the part of a few; senseless taxation which threatens to kill the goose which lays the golden egg; and legislation prompted by intreests that, in many cases, cannot compete with natural gas on equal terms.

As natural gas fields were discovered in the United States, pipe lines were constructed to these fields at enormous expense so that fast dwindling reserves might be increased and thousands of cities and towns and industries depending on natural gas might enjoy use of this fuel for a longer period. The discovery of the large fields in Pennsylvania, West Virginia and Kentucky had permitted the construction of a vast network of pipe lines which supplied many communities in these states. In comparatively recent years the opening of large reserves in Louisiana permitted transportation of natural gas to St. Louis and to cities and towns in the southeastern part of the United States, chiefly in Mississippi, Alabama and Georgia.

Then the greatest field of all, the Texas Panhandle, was discovered and pipe lines were constructed from that area in all directions—north to Denver, south and east through Texas, northeast to the farming and industrial centers of the Middle West, and north and east to Chicago and to connect with already existing pipe lines as far east as near Indianapolis, Ind. The Texas Panhandle Field is the largest single producing field in the world, being 115 miles long and averaging 20 miles in width.

Pipe Lines Serving Field

Completion of the various major natural gas pipe lines from the Texas Panhandle are tabulated as follows:

January, 1926—The Northern Texas Utilities Co. started carrying gas to towns in northern Texas, the largest being Wichita Falls.

July, 1927—The Lone Star Gas Co. started running gas to towns in North Texas, including Fort Worth and Dallas.

January, 1928—The South Plains Pipe Line Co. began transportation of gas to towns south of Amarillo and in West Texas, this company now being called the West Texas Gas Co.

February, 1928—The Cities Service Gas Pipe Line Co. began taking gas through its line to Kansas City, Mo.

June, 1928—The Canadian River Gas Co. began carrying gas to cities and towns in Colorado, the principal points being Pueblo and Denver.

November, 1928—The Consolidated Gas Utilities Co. began transporting gas to Enid, Okla., and Wichita, Kans. This company is now known as the Texas Panhandle Gas Co.

June, 1931—The Panhandle Eastern Pipe Line Co. began running gas through its line which terminates near Indianapolis, Ind.

October, 1931—Texoma Natural Gas Co. began transportiug gas through its line. This gas is transported by the Natural Gas Pipe Line Co. of America to markets in Nebraska, Iowa and Illinois, the principal points of consumption being Chicago and vicinity.

May, 1932—The Northern Natural Gas Co. began running gas through its line to points in Kansas, Iowa, Nebraska and Minnesota.

These pipe lines consist of a total of approximately 4,425 miles of large-diameter pipe, not including laterals or branch lines. They have a daily capacity of 912,000,000 cubic feet.

The investment in these pipe lines, compressor stations and other equipment incident to the transportation of natural gas is well over $200,000,000.

Discoveries of natural gas fields in northern Pennsylvania and southwestern New York have opened the door to natural gas facilities to cities and towns throughout the East. Principal companies owning and operating pipe lines in that territory which are interested in the field development and the extension of pipe lines to transport gas to eastern markets are the Standard Oil Co. (New Jersey), Columbia Gas & Electric Co. and Cities Service Co. Already natural gas lines extend almost to the city limits of New York and Philadelphia while connections have been made into Washington and other large cities.

In the eastern section of the United States there is a vast market for natural gas. If reserves are sufficient to provide pipe line capacity over a comparatively long period of years, pipe lines will be constructed to many additional points throughout the East. The three companies mentioned above have been making a very careful survey of reserves and other conditions for a long time with the view of possibly extending natural gas lines and constructing new lines.

Through the Middle and Central West there are hundreds of thriving communities which can be served with natural gas if conditions relating to waste in the field, laws and taxation are so adjusted as to insure steady and long service at a reasonable return to the pipe line companies.

Few people can even visualize the tragic waste of natural gas in the Texas Panhandle. The volume of natural gas blown into the air and, naturally, wasted, in the Texas Panhandle Field, totaling 1,000,000,000 (one billion) cubic feet a day, is practically equivalest to the total domestic consumption of natural gas in the entire United States. This waste is stimulated, many contend, by laws and regulations of the state and state agencies. For instange it is said the stripping law, permitting operators to strip natural gas of its gasoline content and then blow the residue into the air, has resulted in an increase in gas being blown into the air from gasoline plants from 205,685,000 feet in February, 1933, to 859,935,000 feet per day in June, 1934.

Natural gas production in the Texas Panhandle up to July 1 of this year totals 4,269,720,602,000 cubic feet, but of this quantity natural gas pipe lines got only 598,763,155,000 feet, the remainder being treated for gasoline, being blown into the air or used for carbon black plants.

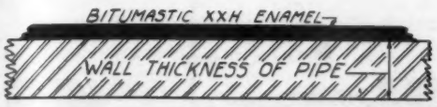
In excess of 7,000,000 people reside in the cities and towns served with natural gas from the Texas Panhandle. The dissipation of these reserves will affect many industries and communities.

LATEST DEVELOPMENTS IN PIPE PROTECTION

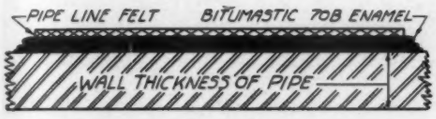
Special Coatings for Every Corrosive Condition

BITUMASTIC 70-B ENAMEL is our latest grade of Bitumastic. It has been developed after many years of research. Like other Bitumastic products, it is also an all coal tar base material. It requires no fluxing in winter and will not sag in summer. It is recommended for all types of shielded or wrapped, machine-applied coatings. All possibility of cracking or sagging, caused by wide temperature changes after the coated pipe leaves the shop or storage yard is eliminated.

CEM-WRAP is our latest mechanical development. The machine is of simple construction. It quickly applies at reasonable cost many types of reinforced and shielded coatings to oil and gas pipe lines. This machine makes it possible for the first time to apply by one machine a wide variety of reinforced and shielded coatings to meet every corrosive condition.



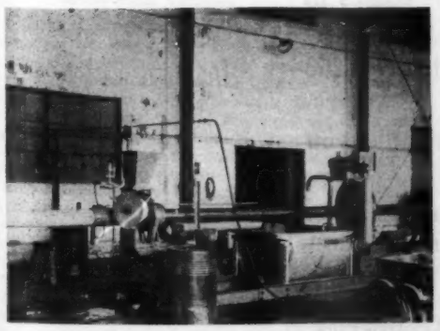
TYPE A.



TYPE B.

TYPE C.

TYPE D.



CEM-WRAP Machine

TYPES OF PROTECTION

TYPE A. A hot coating of BITUMASTIC XXH ENAMEL is applied over a priming coat of cold Bitumastic Solution. The enamel is applied by sling, rolling rig, or other mechanical means to a thickness of approximately 1/16-inch. Its protective value has been proven on many thousands of miles of buried pipe lines. We, therefore, recommend its use for most pipe lines. Where the mechanical action of the soil requires the thicker reinforced or shielded coatings, one of the following types may be used.

TYPE B. A hot coating of BITUMASTIC 70-B ENAMEL—1/16″ thick—is first applied by our CEM-WRAP machine, over a primer of cold Bitumastic Solution. This is then shielded by a spiral unbonded wrapper of pipe line felt, applied in the same machine. Total thickness approximately 3/32 inch.

If desired, the felt can be bonded to the underlying enamel. Enamel can also be applied over the felt. Kraft paper can also be applied spirally over the finished coating. Total thickness approximately 5/32 inch.

TYPE C. A double coating of BITUMASTIC 70-B ENAMEL, a wrapping of pipe line felt, a single coating of BITUMASTIC 70-B ENAMEL and a second wrapping of pipe line felt, are applied to the primed pipe in successive operations in our CEM-WRAP machine. Each layer of coating and felt is compressed under pressure to squeeze out all pinholes and voids. This results in a very dense and homogeneous covering. Total thickness approximately 7/32 inch.

If desired, BITUMASTIC 70-B ENAMEL may be applied over the second felt wrapper followed by a wrapping of Kraft paper. Total thickness approximately 9/32 inch.

TYPE D. A CEM-WRAP armor of 1/4″ cement mortar is applied immediately following the application of a 1/16 inch coating of BITUMASTIC 70-B ENAMEL. The pipe is previously primed with Bitumastic Priming Solution. A heavy cotton cloth is used as an outside wrapper. During application it becomes thoroughly saturated with cement grout. This adds tremendously to its strength and in itself offers considerable protection from corrosion. A very dry mix is used and subjected to high frequency vibrations during application. This results in a cement mortar armor of surprising density and hardness. This dense and hard shield obviously offers the best possible protection against mechanical soil stress. The increased density prevents deterioration of the cement shield from chemical action of the soil. Such deterioration has been frequently observed in cement shields applied by forms or other methods. Total thickness approximately 5/16 inch.

COST OF CEM-WRAP

The cost of CEM-WRAP (Type D) including the successive applications of Bitumastic Solution, Bitumastic 70-B Enamel 1/16″ thick, Cement Mortar Armor 1/4″ thick and the cement impregnated outer cloth wrapper, compares very favorably with the cost of the thinner shielded or reinforced coatings heretofore available.

WAILES DOVE-HERMISTON CORPORATION

17 Battery Place, New York

BITUMASTIC CEM-WRAP

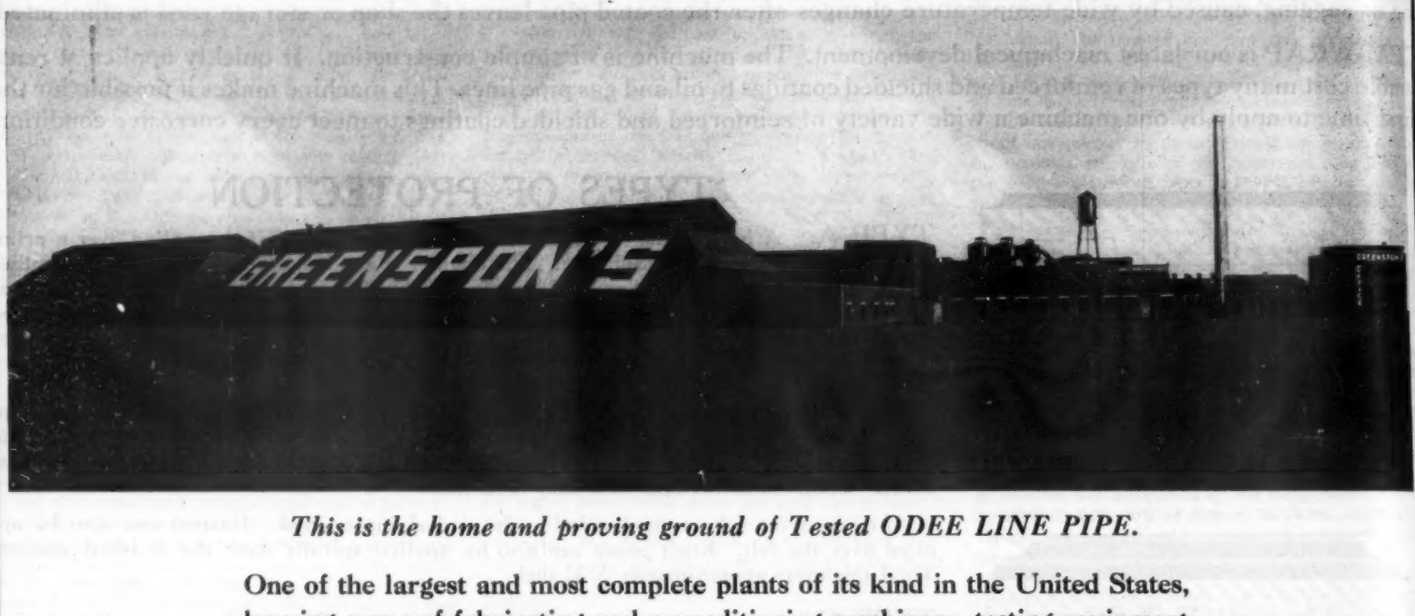
LOS ANGELES
SAN FRANCISCO
PHILADELPHIA

Special Protective Coatings FOR USE UNDERGROUND and UNDERWATER

TULSA
CHICAGO
CLEVELAND

AT YOUR SERVICE—

with 20 years of successfully serving the Oil and Gas Industry . . . . . .



This is the home and proving ground of Tested ODEE LINE PIPE.

One of the largest and most complete plants of its kind in the United States, housing acres of fabricating and reconditioning machinery, testing equipment and miles of pipe stock.

TESTED ODEE LINE PIPE GUARANTEED

for High Pressure Oil and Gas Lines

★ **SAVES WELDING AND EXTRA LABOR COST** . . . . it comes in double lengths. Plain-end, Beveled and Coated.

★ **TESTED** . . . . every length is subjected to a high hydrostatic pressure to insure its utmost safety.

★ **GUARANTEED**. . . . to deliver the service and safety that you expect of high grade pipe.

★ **LOW COST** because ODEE LINE PIPE, which has been *proved in service,* reconditioned and *tested again* in our plant is *priced so as to keep your costs at a minimum.*

Complete stock of sizes for gas, gasoline plants and refineries.

A recently completed contract for 50 miles of pipe, from 2″ to 24″ for an East Texas gasoline plant proved every joint to be without defect.

Proof of the above will be furnished on request.

JOS. GREENSPON'S SON
PIPE CORPORATION

NATIONAL STOCK YARDS (ST. CLAIR COUNTY), ILL.
(Directly across the Mississippi River from St. Louis)

Economic Value, Construction and Operation of Pipe Lines for Transportation of Gasoline

Gasoline transportation by pipe line is just as natural a development as crude oil transportation by pipe line, and the refiners' need in both cases has dictated the development.

In the early days of crude oil refining when there was only a limited market for its products, refiners found it practical to build their refineries in the producing field itself, hauling both raw and finished products by any means already available.

As the market for refinery products developed, short pipe lines were made use of to transport the crude from the producing areas to refineries located at the nearest railroad point. When further uses of the products developed, and new products were found, crude oil pipe lines were extended to points near the points of consumption, until at this time every populated area in the United States is served by refineries that have been built practically within their boundaries. During these various stages of development the oil field refiner was extending his marketing territory farther from his point of manufacture, and it was becoming more difficult as his refinery yields were increased to find economical markets for his products. With the development of the cracking process, in which his gasoline yields were practically doubled, it became necessary for him to face stiff competition of a refiner located in the populated area.

As the oil field refiner analyzed the situation, it was quite evident that his market was limited only by reason of the transportation costs on his finished products. As the crude oil pipe line had relieved a similar condition in the early development, it became evident that a gasoline pipe line would relieve the situation that was becoming so critical.

Economical Volumes

A gasoline pipe line is possible where economical volumes are involved. Figures of cost and operation will show the refiner the volumes that can be economically handled, presuming of course, that rail transportation tariffs are greater than pipe line pumping costs. A canvass of tariffs over the territories to be served will quickly determine this point.

Rail transportation by tank car can be analyzed with various assumptions from the terminals of the proposed pipe line. Before any definite proposal, however, can be made involving the construction of a pipe line, short line haul tariffs must be definitely set, and truck transportation as a substitute for tank car transportation must be analyzed, bearing in mind the limits that can be reached by truck transportation. After all short line tariffs are established, it will be shown that combination pipe line and railroad is a very logical arrangement.

On the assumption that 2,500,000 bbls. per year are available for two points approximately 200 miles apart, and assuming that this barrelage is distributed over the year in varying seasonal percentage demand, a study of the proportionate daily pumuings of this amount against a proportionate daily requirement for a five-month peak operation, will probably show the proper design of line and stations for a maximum pumping of 13,000 bbls. per day.

An analysis of this maximum pumping will develop that a 6-inch line with stations approximately 50 miles apart would be the most economical design, bearing in mind that prior to the need of looping the line, that boosters placed every 25 miles would give an added capacity of approximately 50 per cent and would allow the line to more quickly amortize itself by reason of a smaller investment in a 6-inch pipe line than the larger investment in an 8-inch pipe line, even though the economical operation of a 100 per cent increase would be in favor of first constructing an 8-inch pipe line with stations approximately 100 miles apart.

If it is agreed, therefore, that a 6-inch pipe line is to be constructed, the design, and later the construction, can proceed. A tabulation of the various items to be considered follows:

Pipe: Seamless, lapweld, electric weld.

Stations: Brick, steel.

Prime movers: Gasoline, multiplicity of units; Diesel, multiplicity of units; electric, multiplicity of units.

Pumps: Reciprocating, centrifugal.

Station facilities: Open cooling system, closed cooling system.

Station tankage: Size, number.

Housing: Type, number.

Station sites: Topography, size, location with reference to line hydraulics and accessibility.

Terminals: Products to be handled; blending operations; accessibility to railroads, waterways, etc.; tankage—floating roof, breather roof, vapor type, etc.; loading racks and their capacity; number of products to be loaded; number of companies to serve; tank car repair and storage facilities; testing of products in storage and in tank car; tetraethyl lead.

Pipe line construction: Right of way; ditch; pipe protection; railroad crossings; highway crossings; river crossings; type of joint; location of main line valves; facilities for maintenance; proximity to farm buildings and dwellings; location of scraper traps.

Hydraulics of line: Calculation of volumes and pressure drop; load factor and its relation to number of stations; number of products to handle and separation between products for the primary and secondary stations; relation of additional lines to first location; line survey; line profile; aerial survey and its relation to length of line and cost of line.

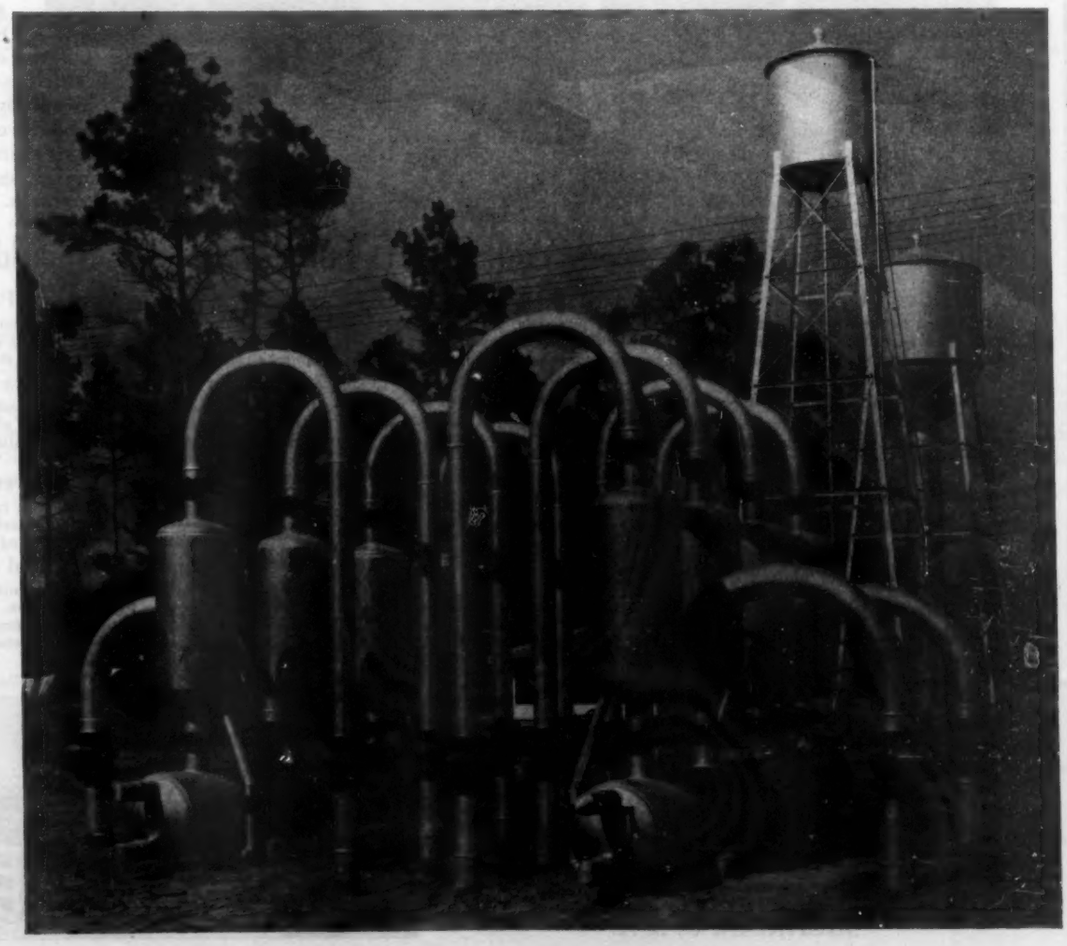
Communication: Privately owned or rental; facilities for dispatcher; facilities for operation; facilities for companies shipping over line; overhead construction; underground construction; railway selective type or magneto type; nonrepeated versus repeated; metallic circuits and carrier circuits.

Pipe

The designer has various points of merit to consider in the three classes of pipe indicated in the foregoing, each indicating its desirability as the most satisfactory pipe to use. Seamless will have preference in that the possibility of fracture from shocks and pressure is small; lapweld by reason of previous experiences with this type which show that it is very satisfactory in its operation and maintenance; electric weld by reason of its cost and its uniform wall thickness. Assuming that there is a question in the designer's mind as to any saving in initial cost in the use of lapweld, this will probably be eliminated when consideration is given to the type of joint that will be used. Seamless therefore will probably be compared with electric weld, and the designer has little or no choice between the two. He may, however, assume rightfully that the uniform wall thickness of the electric weld will permit him to use a pipe of smaller wall thickness—so finally, pipe may be chosen for price alone.

Stations

A wider variation between designers occurs in the design, type and construction of pumping stations than any feature under consideration in the whole pipe line system, and the design will depend upon the amount of money for the



Scrubber at United Gas Co. station, Conroe, Texas

McCORD CLASS "SF" MECHANICAL LUBRICATORS

CYLINDER and bearing lubrication is a factor of prime importance in heavy-duty engines, compressors, and prime movers of all types. The oil film must be maintained between moving parts in just the right measure and consistency, or friction soon takes its heavy toll of needless wear, and lost efficiency. Because you cannot see the oil film being applied, you must select a lubricator that will see for you—one that will apply oil without failure when it is needed, where it is needed, and in an accurately calculated amount, without variation, for long periods.

For this exacting work the McCord Class "SF" Mechanical Lubricator has been developed. No expense has been spared in the design and construction to make it the best lubricator of its kind; in its manufacture no short-cuts to price have been taken at the expense of quality.

Fundamentally, it consists of an oil container or reservoir carrying one or more independent pump units, which are actuated by motion transmitted through an operating shaft traversing the entire length of the container, and employing various types of drive. Pumps are of the vertical differential plunger type, with pump body of brass forging, for long life, and minimum wear. Plungers and allied working parts are fitted to an accuracy of 1/10 of 1/1000 of an inch. Equal care has been used in designing the exterior of the lubricator to insure compactness and smoothness of all parts and surfaces.

Check These Features on Your Next Lubricator—It Should Have Them All!

1. Positive Oil Delivery at all Times.
Oil should be delivered at frequent and regular intervals, in a pre-determined charge sufficiently large to maintain the oil film on moving surfaces. McCord Class "SF" Lubricators have been designed with precisely these conditions of operation in view.

2. Rugged Pump Construction.
McCord pump units are simple, sturdy and accurate, positive in operation and independently mounted. McCord pump units are the most accurate and efficient known.

3. Flexibility of Oil Delivery.
McCord Class "SF" Mechanical Lubricators have the most flexible and accurate oil delivery known. It is not necessary to disassemble any part of a McCord Class "SF" lubricator in order to make adjustments.

4. Removable Pump Units.
Any pump unit may be removed on the McCord Class "SF" Lubricator without stopping the lubricator, nor in any way interfering with its operation.

5. Timed Injection.
Even though timed injection is not used, it is highly desirable to operate the lubricator at relatively high speed in order to have small quantities of oil delivered at frequent intervals.

6. Adaptability to Source of Power.
Eighteen types of drive are provided on the McCord Class "SF". A McCord Class "SF" Lubricator may be placed anywhere, either directly on the machine or remote from it, according to the requirements of the job.

7. Two-Way Discharge—Extra Large Liquid Sight Feed.
Oil is discharged in the Class "SF" Lubricator either through the top outlet or the back, in ordinary installations, although where sight feeds are placed in the oil line near the point of application, four-way sight feeds may be installed.

8. Taper Nozzle Gives Accurate Oil Delivery.
The size of the oil drop leaving the tapered sight-feed nozzle is approximately one gravity drop, the universal standard for measuring lubricants. The nozzle is readily removable giving access to the sight feed check ball.

9. Simplicity and Sturdiness of Construction.
McCord Class "SF" Lubricators are made of the best materials obtainable. Reservoirs are of the finest gray iron. Pump bodies are of the best brass forgings with plungers of tool steel, accurately fitted and lapped. Ball checks are the highest grade chrome-nickel steel. All parts are made oversize for extra sturdiness and long life.

When you need lubricator counsel, write

McCORD RADIATOR & MFG. CO.
Lubrication Division
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venture and whether maintenance and general overall appearance is an item to be considered in the operation. Main pipe line systems generally are for use over a period of many years. If the oil executive, therefore, is to assume that his venture will have a life of 10 years or more, it will be determined to use a more permanent construction than structural steel and iron buildings.

Prime Movers

The choice between gasoline engines, Diesel engines and electric motors is one of calculated ultimate costs, and with experiences that engineers and operators have had, this cost can be quite readily determined. The gasoline engine is disposed of quite readily. It, however, must be considered by reason of the availability of fuel, which, of course, is the same type as the prime product being handled through the pipe line. A run up of the cost at the individual stations furnishing gasoline for fuel is possible and will determine whether gasoline engines are, economically, best to install. Assuming that it is not economically possible to use gasoline engines, there is a choice then between Diesel prime movers and electric motor prime movers, and with rates that power companies are ready to furnish at any time, a comparison here can be made. The cost of installation, availability of water, and money for the construction, however, will be factors for or against the Diesel prime movers, and assuming that sufficient money is available for any type of installation, the pay-out status can be set up for the difference in installation costs between Diesel and electric.

At this point, multiplicity of units will come under consideration, and in all probability two or more units will be installed, for, in this manner, a continuation of operation is possible under the most unusual circumstances.

Pumps

The designer has a choice between reciprocating and centrifugal pumps, irrespective of the type of prime mover chosen. If, however, a reciprocating pump is under consideration, it will probably be determined that the variable speed of a Diesel engine is the most practicable. If power factor and lower efficiency is of no particular importance, it might be determined that the reciprocating pump with an oversized motor can be installed. The reason for the oversized motor is the possible change of plungers and gears to increase the pump capacity. The advantages of the reciprocating pump with a Diesel engine are many; first, the ability to vary the pumping rate and to handle larger capacities by changing only the plunger sizes; second, positive displacement with uniform pressure and load characteristics; third, its freedom from unusual maintenance and breakdown; fourth, its increased efficiency over a centrifugal pump.

The first advantage of the centrifugal pump is its compactness and its cost of installation; second, its lack of pulsation, which in theory some authorities have determined to be beneficial to the

flow and capacity of the pipe line itself. The centrifugal pump, however, when combined with other than an electric motor, has the disadvantage of being driven through step-up gears from a slow prime mover. This adds to its maintenance and lowers its over-all efficiency. Excessive leakage from packing glands is also an element to be considered.

Station Facilities

On the assumption that a Diesel pumping station is to be installed, there are various questions to be answered concerning the facilities serving the Diesel engine; first, the arrangement of the fuel and whether large overhead quantities or small quantities of fuel oil are to be installed; second, whether a closed or open type of jacket water cooling system is to be used; third, the economics of cleaning and re-using lubricating oil.

In the first, the engineer will find that common usage is to equip a station with elevated tankage of more than a day's capacity. In the second, his choice between an open and closed cooling system will be influenced by the cost of the one over the other, and the quantity and quality of the water available at the station. He will also be influenced in his choice by the maintenance and operation between the two systems. If good water can be procured in large volumes, the low maintenance cost and the lack of attention required in emergencies will probably favor the open type system. If there is a shortage of water or the water is of inferior quality, he will probably decide that the closed system is the most economical and convenient, it being noted in his consideration of the closed system that he has a large volume in his pipe line of cooling fluid at subnormal temperatures, the volume being in excess of what is required for low temperatures of the jacket water. He will also find that with little expense constant circulating volumes of cooling water are possible at any predetermined temperature and that this feature is very beneficial to the operation of the Diesel engine.

Station Tankage

Station tankage is necessary only as determined by the pipe line operation, and is a storage consideration only, for in the case of the Diesel, surge tanks of small diameter and considerable height can be installed. In the case of the centrifugal, no tankage is required, so in anticipation of continuous operation, holdover and line breakage, the size and number of tanks at each station or at every other station can be satisfactorily determined.

Housing

Housing for employes operating in and about the station area is a matter of experience with various types of stations that are to be installed. However, it might be noted here that in the case of the electric station there is a tendency towards not furnishing any. In the case of a Diesel station, the chief engineer only, or the chief engineer and all engineers have been provided with dwellings, and the operation of the system as a whole, the type of maintenance given the system, will determine the economics of this arrangement.

Station Sites

Station sites are first determined from the hydraulics of the line; second, from the topography of the sites available; and third, their proximity to facilities that would be advantageous in the operation, these facilities, of course, including water supply and roads.

Terminals

The general location of all terminals is influenced by the rail connections possible for use at these terminals. In a smaller way also, to the topography of the sites available, as well as to the natural facilities adjacent to the sites, such as roads, housing conditions, and the possibility of extending the pipe line from them. The size and the topography of the terminal sites are also influenced by the number of products to be handled, tankage requirement, and the blending operations that will be necessary in the operation. The size of the loading rack and the storage of tank cars is also of importance.

On the first assumption, it was determined that the maximum requirement at the terminal would be 13,000 bbls. per day, or approximately 65 cars. This would bring under consideration many things that will influence the type and length of the rack. First, it will be noted that a 1,300-foot rack is necessary if all cars are to be loaded at one spotting. Consideration will also necessarily be given to the possibilities of two separate movements of tank cars in and out of the rack, and a study of the seasonal loadings being necessary. It is, however, highly improbable that a 1,300-foot rack would be constructed unless terminal location is remote from any railroad switching facilities. If this were true, the economics probably would show that two racks of 650 feet each would be the best for the operation. The type and number of the terminal personnel will influence the design of the rack. The designer will have his choice between headers constructed under the rack with risers to points above the tank car and headers constructed over the rack, with drop pipes to the tank car. In the latter design, it can be determined that headers over the rack are limited. However, with the use of two short racks, instead of one long rack, it can be seen that the location of 10 separate lines is possible, assuming that 6-inch headers are used. The overhead headers have the advantage of convenience to the loaders, in that all downspouts may be counterbalanced so as to be handled quickly and safely with one man. It also may be noted that where the overhead type of loading rack is first constructed, that lines can be added on the ground with vertical risers, to take care of additional products.

The storing of pipe line products at the terminals brings under consideration all the various types of tank construction now available; namely, vapor type roofs, breather type roofs and floating type roofs. It is now an accepted fact, however, that for gasoline storage, either the breather roof or floating roof is the most economical; and for working storage, it is probable that everything is in favor of a floating roof and that these roofs will more than pay for the additional cost in a short period of time. The size and number of tanks depends largely upon the demand made on the terminal and the movements into the terminal. However, various gasoline pipe line operators have found it to be very practical to install smaller tanks and more tanks for the quantities involved in the operations. This is particularly true as seasonal blends are coming more and more into use, and treatment of the gasoline with tetraethyl lead is required. A careful study of the type and number of tanks is, of course, of prime importance, and only the operation of the particular system will answer this problem.

Construction of Pipe Line

From the tabulations under pipe line construction it can be noted that gasoline pipe line construction involves all the contingencies that affected the crude oil construction, and each in its turn is of prime importance. The right of way under modern construction is adequately served, the requirement being 30 feet in width.

The ditch, as in a crude oil pipe line, can vary in depth as to the type of country traversed, but should be of sufficient width to allow for the pipe line being laid with adequate slack.

Pipe protection today is a matter of personal choice, and it is becoming more evident in recent construction that pipe line companies are willing to treat each corrosive condition individually, anticipating, where possible, and waiting on their experience where it is impossible to predetermine the life of the pipe line in the ground.

Railroad and highway crossings can be more or less considered together, and it will be found that the type of construction used on these is influenced by the requirements of the individual railroads in the case of railroad crossings, and the individual states in the case of highway crossings. It is good pipe line practice, however, to have the pipe line carrying the fluid enclosed in a conductor pipe under permanent structures.

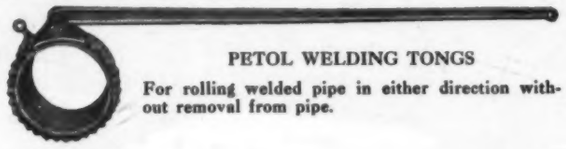
River crossings are individual problems and can be multiple or single, depending upon the possible maintenance that might be involved. Where there is any doubt, multiple crossings should be used of the same size as the main pipe line, and with manifolds that will permit of ready

Header installation on river crossing

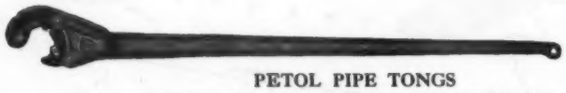
ON EVERY LINE

—Domestic and Foreign—
SINCE 1931

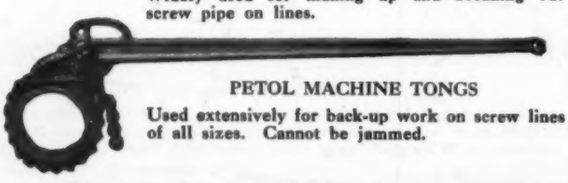
One or more types of PETOL pipe line tongs have been used on every major pipe line construction or reconditioning job since 1931.



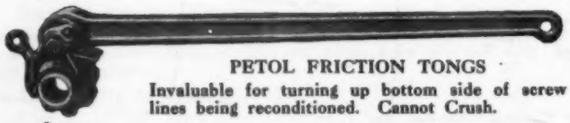
PETOL WELDING TONGS
For rolling welded pipe in either direction without removal from pipe.



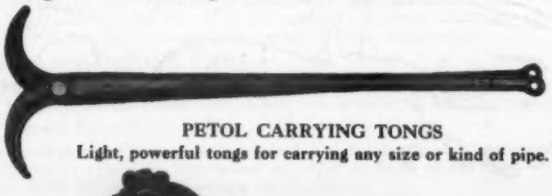
PETOL PIPE TONGS
Widely used for making up and breaking out screw pipe on lines.



PETOL MACHINE TONGS
Used extensively for back-up work on screw lines of all sizes. Cannot be jammed.



PETOL FRICTION TONGS
Invaluable for turning up bottom side of screw lines being reconditioned. Cannot Crush.



PETOL CARRYING TONGS
Light, powerful tongs for carrying any size or kind of pipe.

18 Types **150 Sizes**

PETOL STABBING TONGS
Speeds up construction work on small screw lines about 25%. One tong fits many sizes of pipe.

GEARENCH MFG. COMPANY
HOUSTON, TEXAS, U.S.A.
"MOST COMPLETE LINE OF TONGS IN THE WORLD"

PUMPS DESIGNED *EXCLUSIVELY* for.. ....Pipe Line Service

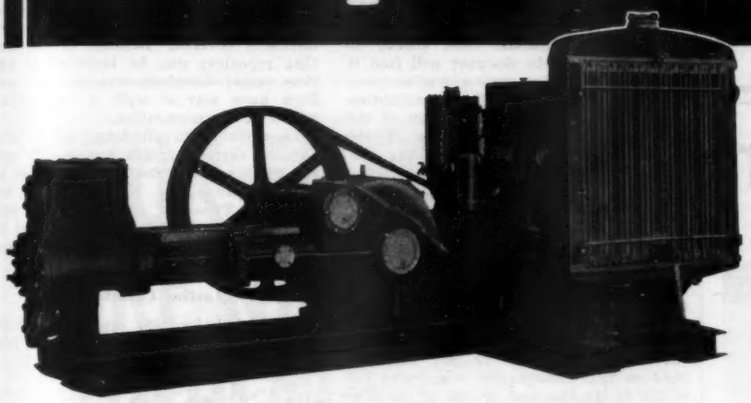


FIG. 1741—GASO Interchangeable Liner Pump for long oil or water lines. Working Pressures, 300 to 650 lbs. Capacities, 500 to 250 bbls. per hour. Shown above with Diesel Engine drive through V-Belt, mounted on skids.

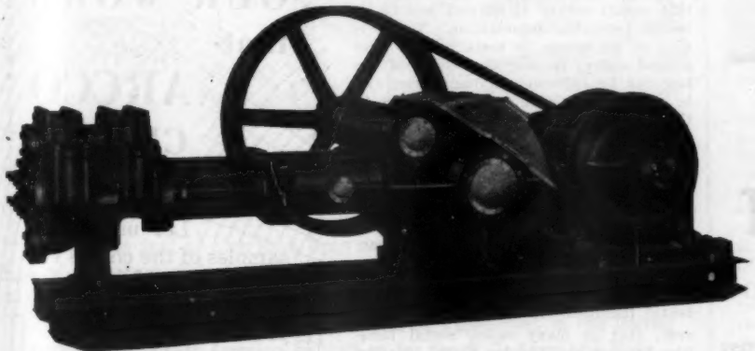


FIG. 1742—GASO Interchangeable Liner Pump, Side Pot type, driven by Electric Motor through V-Belt. Working Pressures, 650 to 1400 lbs. Capacities 250 to 54 bbls. per hour. This pump can be furnished arranged for any type drive: (1) Pulley for belt drive; (2) Direct through flexible coupling to Gas, Gasoline or Diesel engine; (3) Motor through silent chain or reduction gears; (4) "V"-Belt drive to motor or engine.

Two "P's"—Pipe and Pumps—are the basic requirements in pipe line operation. GASO has specialized for 19 years in providing the kind of Pumps that will serve best in the pipe line field.

Careful specialization has earned its usual reward. Throughout the industry, the pipe line companies have recognized GASO Pumps as especially suited to their requirements—and the result has been a steady, sure growth in the Gaso business, from year to year.

This steady progress based on merit is assurance that Gaso will be here another 19 years, to service the GASO Pumps you buy today.

GASO Pumps are characterized by simplicity of design, extra sturdy construction, few parts. They stand the gaff of pipe line service. The first GASO Pumps placed in operation are still in service, today.

Rodline, Jerker, Walking Beam, Steam and Power Pumps. 30 to 1045 barrels per hour. Ask for new catalog.

GASO PUMP & BURNER MFG. COMPANY
Tulsa, Oklahoma
Export Office: 149 Broadway, New York City.

GASO PUMPS

access in the case of loss of any line or by the use of pipe line scrapers.

The type of joint used in gasoline pipe line construction is of prime importance, and because of the lack of experience in gasoline pipe line operation, all companies constructing have used as solid a joint as is possible. This has been, in all cases, welded joint, the type varying between oxyacetylene and electric, depending upon the personal preference of the men making the decision. The management of one gasoline pipe line having experience with an oxyacetylene joint has recently constructed a line with an electric welded joint, making use of double bell and chill ring pipe. Its reason was that the chill ring prevented the forming of a heat scale on the interior of the pipe.

The location of gates will depend upon the experiences of the men designing the line, together with their ability to anticipate their need. It is common practice, however, to place gates approximately 5 miles apart, this to be varied by the accessibility of their location to roads.

The facilities for maintenance of a pipe line will govern somewhat the location, and pipe line proximity to buildings of all kinds should be studied carefully, bearing in mind that an emergency may arise whereby any one foot of the pipe line might have to be reached.

Scrapers

The need for scraper boxes on a gasoline pipe line is just as great as on a crude oil pipe line, and scraper boxes should be placed as often as is practical, being sure that their location allows for drainage away from the pipe line; also, that it is possible to reclaim the fluid from the pipe line.

Hydraulics of Line

Engineers are at variance in the calculation of the flow in the various size pipe lines of even crude oil, and when an engineer is called on to calculate the capacities of a gasoline pipe line, unless he has had previous experience in the flow of gasoline through the size of line he is proposing, it will be necessary for him to assume various items in his calculation. In all probability, he will compare gasoline with water when considering viscosity, and in making a search for comparable pumpings, both crude and with other liquids, he will probably decide that the Hazen-Williams formula best suits his needs. He will, however, be confronted with extrapolation of the "C" value of this formula, and he will use the experiences of the flow of gasoline in smaller size pipe to determine the relation of this "C" value. After deciding that the water formula would come closest to what an exact gasoline formula would be, he will interpolate for the weight of gasoline in comparison with water and make these corrections in the formula. If he has made some research in the pumpings of gasoline in smaller lines, he will find that the "C" value of gasoline is higher than the value he would use if he were calculating the pumpings as water, and will probably decide that the "C" value indicated for water for the first year or two of water pumpings would be closer than any other data available, and will proceed with the ordinary calculations.

As mentioned previously, load factor and ultimate use of the pipe line will determine the number of stations to be constructed, and this will enter into all calculations in the hydraulics of the line, but will be influenced, in addition, by the number of products to be handled through the pipe line, and the separation between products. The amount of contamination, if no separating fluid is used, will cause the designer to give consideration to the high velocities, on the assumption that there will be less channeling of products in the pipe line.

In all matters of design throughout the system, additional lines should be considered, and the designer will find it helpful if he will assume a system twice the first capacity. This assumption should be carried to the location of the pipe line, location and design of the station, and to all sites, including terminals and stations.

The line survey is of extreme importance in determining the station sites, terminal sites, and general size and character of the mechanical equipment to be installed, and it is good practice that wherever it is possible to secure government topographical sheets, a preliminary calculation be made. In addition to this, if time is short, sufficient survey parties should be put into the field so that information concerning location of the line and profile of the line be quickly available. Preliminary maps and profiles should be quickly developed, the map particularly, so as to be of use by men in securing right of way. It has been found by various pipe line companies that aerial survey is of real benefit in readily securing information. There is also an advantage in aerial survey over ground survey in that the length of the line can be reduced and many uses can be made of aerial photographs, even in the operation of the line.

Communication

Some form of communication is necessary in all pipe line operation. This is particularly true of a gasoline pipe line. The men responsible for the construction and operation of a pipe line have the choice between privately owned and rental facilities. It will be found, however, that in many cases, rental facilities are not possible due to the location of the pipe line system, and a combination of both private and rental facilities might be determined on.

The dispatcher has first call on communication lines of any pipe line system, as he must be continually in touch with all the operations; for that reason a line available for his use only is advisable.

The operators of a pipe line, other than the dispatcher, can use the telephone to good advantage, and at some saving over operation without these facilities. This can develop into a separate means of communication to the various points along the system, or be combined with the dispatcher's means of communication.

Various companies tendering products to a gasoline pipe line together with shipments from the pipe line, make it necessary that adequate facilities of communication be available. These can be provided without disturbing the dispatcher or operators' lines of communication, because of the type of communication desired. Telegraph or teletype is adequate, with teletype receiving the preference at this time.

In the actual construction of communicating facilities, pipe lines generally have followed the overhead construction. However, there are various advantages in some other means than the overhead construction, and consideration should be given to the possible use of cable placed in the pipe line ditch. This has seen little or no use, due to the complexity of the added equipment needed in the underground installation. New devices and new construction of underground cable, however, together with simplified repeaters, is bringing this type of construction to the attention of pipe line operators everywhere.

The type of privately owned telephone equipment will be either of railway selector type or a straight magneto type. For the money involved, the railway selector type is to be preferred, as it eliminates continuous ringing over the system on all phones when any one station is being called, and gives the dispatcher control of his circuits. The equipment is rugged and the maintenance on this equipment is very small and the selective ringing is very dependable.

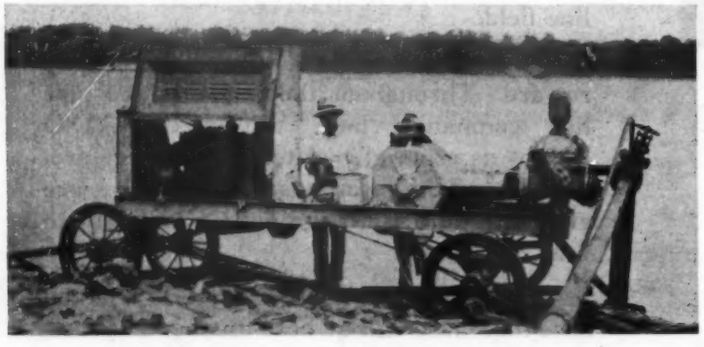
The need for repeated or nonrepeated type of equipment will depend upon the distances covered. Because of the fact that repeaters can be installed at any time, most telephone systems on pipe lines have started with a nonrepeated means of communication.

In addition to all forms of metallic circuits, carrier circuits are possible and are coming more and more into use as separate means of communication are required. These, of course, can be considered in the initial installation and be treated in accordance with the proposed operation of the system.

Letting Contracts

As progress is being made in the final design of the pipe line system, it is pos-

Whip Winter Weather



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sible to let certain contracts in the construction, and if station locations have been made, together with final location of all or part of the pipe line, these two items can be presented to various contractors to bid on their construction. In the matter of presenting the pipe line proposals to contractors, too much stress cannot be placed on the importance of information furnished. Accurate information will always tend to lower the bid price, and it is of extreme importance that maps be presented, together with profiles of the line, showing all physical data. It is also important that the line be staked and flags placed at all road crossings showing where the line is located. If this information is complete, a unit price per foot for the construction is the most satisfactory schedule to use for pricing. If information is not complete, in fairness to both parties a breakdown of the various classifications of work should be indicated in the proposal, for only in this manner can the contractor, without prejudice, make his bid prices.

A pipe line form of contract should cover all contingencies that might enter into the construction of the line, and these should be clear and positive in their declaration. A very satisfactory form of contract is one in which there is incorporated in one section, specifications and requirements that are common to all sizes of pipe and to all localities, making it possible to use these without change in any pipe line contract, and with consequent little or no delay in assembling contract documents for submittal to the contractors. Station contracts follow the same line of procedure as the pipe line contracts, with stress again being placed on the importance of accurate data concerning construction details and construction difficulties.

Care, of course, must be given the choice of pipe line representatives in the construction work, chosen men, wherever possible, with previous experience in the various classes of work that they supervise. These men should have either the qualifications to report accurately the physical placements, or they should have as assistants men qualified to reproduce the design that is finally installed.

With the line constructed and the stations ready to operate on a gasoline project, testing is of prime importance, as gasoline presents a little greater hazard in the matter of repair. It is good practice, in addition to the care given the cleaning of the line during its construction, to wash the line with clear water at as near the same velocity as the operating velocity as is possible, and various gasoline pipe lines have found it advantageous to run both "crude oil type" pipe line scrapers and steel brush scrapers during the time that water is being used for test. The amount of water used on test and in washing the line should be a minimum of two times the pipe line fill, and during this wash and test, the line can be disconnected at halfway points between scraper traps, for if there is an excessive amount of contamination in the pipe line, it is not always possible to carry it the full distance between scraper traps.

Station tests are of the same importance as the main line tests. All pipe and equipment in the station should be tested to its working pressure either with air or water, and all lines should be flown thoroughly of any scale and dirt.

With the line fully constructed and all operators sufficiently informed of their duties, with experience in these duties by reason of line test, station test, and being present before final construction was completed, the pipe line is ready to receive its first gasoline. Chemists in the employ of the pipe line, after detailed test of a character that has been previously agreed upon, okay the product and receiving tickets are issued, and the first station begins its operation.

Operating the Line

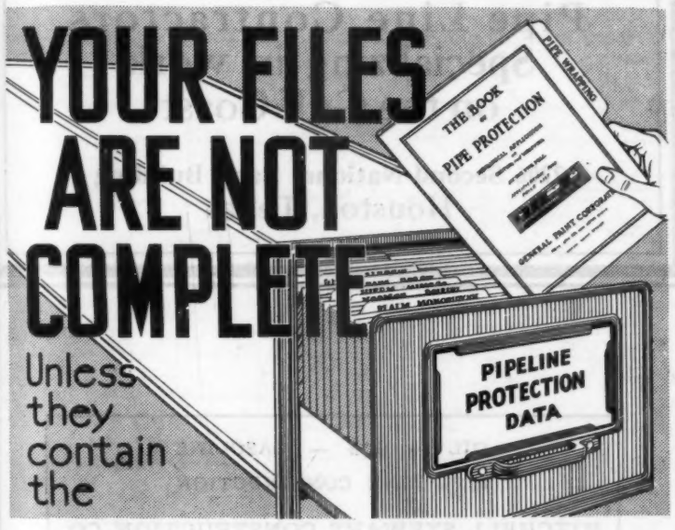
The first displacement of the water in the pipe line will proceed with care to each intermediate station until gasoline has reached its final destination, at which points tanks are checked for gasoline specifications and water is carefully withdrawn from the receiving tank. Operations along the pipe line will proceed from this point in a normal manner, with an hourly and 24-hour check of the movements. Changing of grades will be the only interruption in the routine of the pumpings, and when this takes place the dispatcher and operators will have full information as to time and rate of flow of the new products being pumped. Field operators, by means of test apparatus, will check all passing points on the system. The final receipt into separate tankage at the terminal is in charge of terminal foreman or chemist.

Gasoline pipe line companies' experiences with this method have shown that they can project the time of passing and time of receipt accurately, and that intermingling of products in the pipe line under normal operations is nil.

Assuming that the pipe line is handling products ready for marketing, each product from its respective line can be loaded without complication into railroad tank cars, and the operation, test, etc., is identical at this point to the loadings at our best refineries. The receipt of orders and shipping information at pipe line terminals is identical to the procedure used at all refineries.

If the pipe line is receiving one or more products requiring final blends, and the terminal has been designed for these particular blends, multiplicity of tanks with circulating lines from blending pumps prepare the final product for its delivery to the loading rack through its separate line. In all this operation, terminals are functioning in the same manner as a refinery is with its tankage of base stock and tankage of blending materials, and the loading pump house of a terminal is identical with the transfer pump house of a refinery. Also, tetraethyl lead facilities at pipe line terminals are identical with the best practice used at refineries.

The operating personnel of a gasoline pipe line that is functioning as a distinctly separate unit is as complete as any oil field company, except that work is not so diversified and the pipe line personnel is handling only pipe line matters. Particular detail varies only from the oil company's pipe line detail in that the pipe line may be accounting for the movements of gasoline for oil companies that have no relation to each other. Accounting for the various products and various ownerships requires the most exact information and tabulation.



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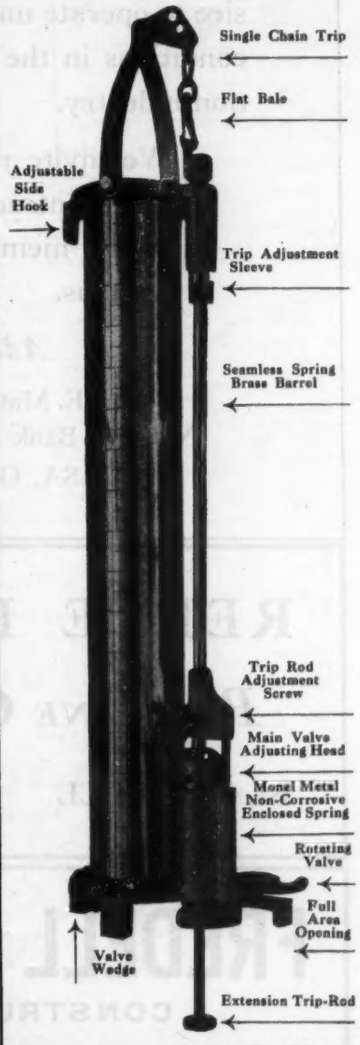

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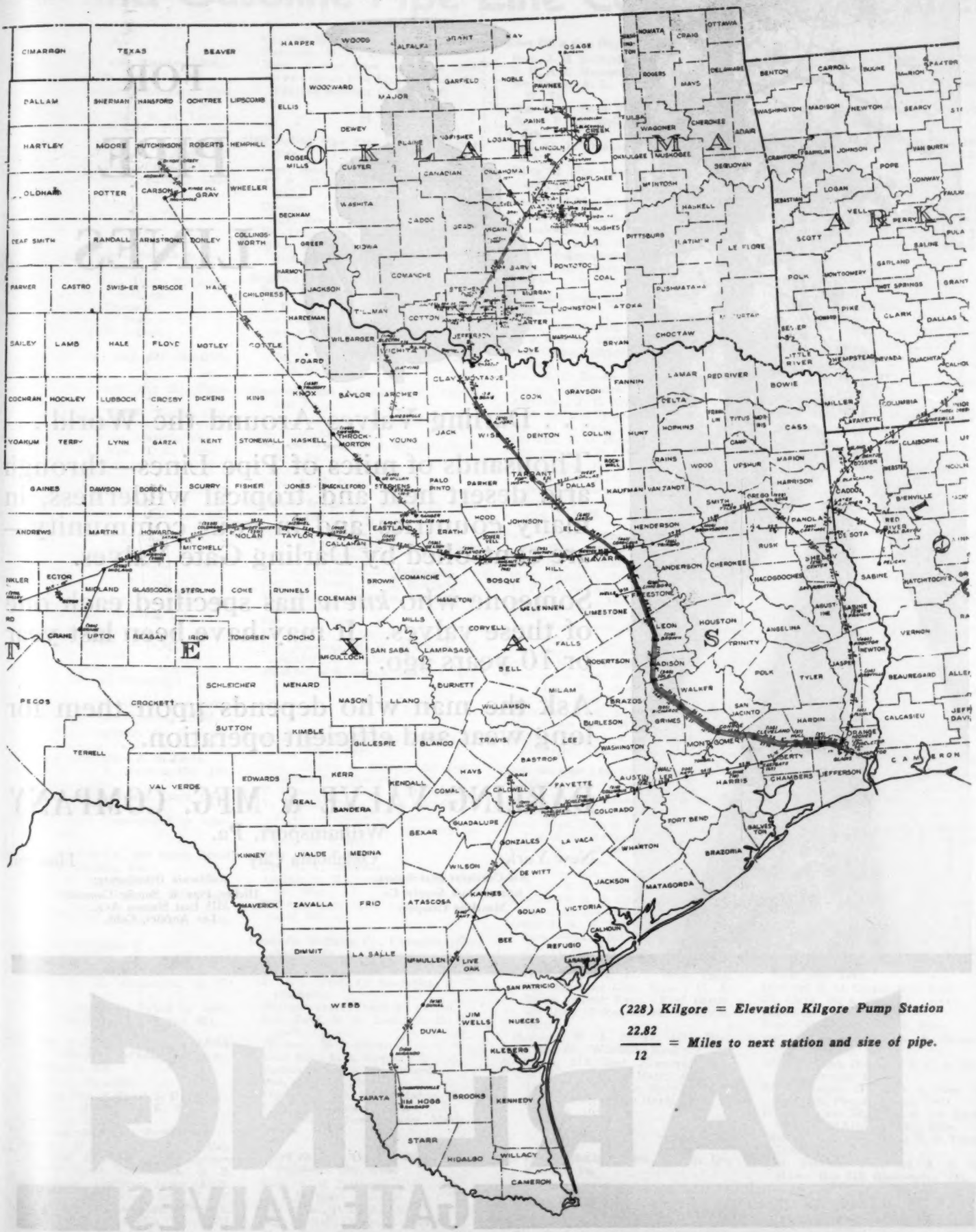
Map of System of Magnolia Pipe Line Co.



(228) Kilgore = Elevation Kilgore Pump Station

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Treas. and Asst. Sec., S. V. Kane, Exchange Bank Bldg., Tulsa, Okla.
Sec., C. L. Bushnell, Exhange Bank Bldg., Tulsa, Okla.
Supt., R. H. Bowers.
Supt. Tel. and Tel., W. S. Dyer.
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Asst. Treas., R. A. Ford.
Asst. Sec., E. A. Sickels, Box 521, Tulsa, Okla.
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Gas Egr., M. K. Watson.
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Directors, J. W. Van Dyke, R. W. Howe, L. M. Goldsmith, R. C. Tuttle.
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Miles of pipe lines owned or operated: Atlas Pipe Line Co., Inc., 57; Spartan Refining Co., Inc., 80.

B

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Miles of pipe lines owned or operated, 15.

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Miles of pipe lines owned and operated, 891.

C

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D

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Miles of pipe line owned or operated, 290.

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E

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F

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Director, Patrick Sullivan.

Franklin Pipe Line Co., Ltd., Franklin, Pa.
Chm., D. W. Grant.
Sec.-Treas., Martha W. Livingston.
Gen. Mgr., D. W. Grant.
Miles of pipe lines owned or operated, 50.

Frontier Oil Co., San Antonio, Tex.
Pres., Alexander Boynton.
V. P., Anna Boynton.
Sec.-Treas, A. C. Harris.
Field Supt., A. B. Higginbotham, R.F.D. No. 1, Atascosa, Tex.
Miles of pipe lines owned or operated, 9.

G

General Pipe Line Corp. of California, 108 West Second St., Los Angeles, Calif.
Pres., A. L. Weil.
V. P.'s, S. J. Dickey, R. A. Sperry, E. L. Adams.
Sec., D. W. Woods.
Treas., W. Cunningham.

Gilmer Oil Co., Ardmore, Okla.
Pres., S. J. Hernstadt, 42 Broadway, New York.
V. P. and Treas, W. L. Hernstadt, 42 Broadway, New York.
Sec., N. Heinsheimer, 42 Broadway, New York.
Supt., J. R. Holder, Wirt, Okla.
Miles of pipe lines owned or operated, 24.

Globe Oil & Refining Co., Blackwell, Okla.
Pres., I. A. O'Shaughnessy, St. Paul, Minn.
V. P., F. L. Jehle.
Sec., R. E. Everitt.
Treas, E. A. Lentz.
Supt. P. L. Dept., F. A. Smalley.
Dist. Foreman, J. A. Smith, Oklahoma City, Okla.; C. W. Whitney, McPherson, Kans.
Miles of pipe line owned and operated, 124.

Great Lakes Pipe Line Co., Kansas City, Mo.
Pres., Dan Moran, New York.
V. P. and Gen. Counsel, James J. Cosgrove, New York.
V. P. and Gen. Mgr., Harry Moreland.
Sec. and Treas., P. A. Ward.
Asst. Sec. and Treas., W. L. Carroll.
Ch. Egr., F. E. Richardson.
Gen. Supt., E. H. Skinner.
Ch. Dispatcher, L. E. Murrell.
Supt. of Claims, Right of Way, Tax and Insurance, Bland Proctor.
Traf. Mgr., C. A. L. Walker.
Pur. Agt., H. F. Swindle.
Directors, Dan Moran, New York; T. S. Lamont, New York; E. B. Reeser, Tulsa, Okla.; Harry Moreland, Kansas City, Mo.; Jacob France, Baltimore, Md., W. G. Skelly, Tulsa, Okla.; C. B. Watson, Chicago; C. R. Musgrave, Bartlesville, Okla.; E. W. Sinclair, New York; W. S. S. Rodgers, New York.

Gulf Pipe Line Co. of Oklahoma, Tulsa, Okla.
Chm. Bd., J. F. Drake, Box 1214, Pittsburgh, Pa.
Pres., F. A. Leovy, Box 1214, Pittsburgh, Pa.
V. P.'s, Rush Greenslade, Box 661, Tulsa, Okla.; E. G. Bothwell, Box 1214, Pittsburgh, Pa.
V. P. and Comptroller, H. A. Gidney, Box 1214, Pittsburgh, Pa.
Asst. to V. P., P. H. Bohart, Box 661, Tulsa, Okla.
Sec., W. J. Guthrie, Box 1214, Pittsburgh, Pa.
Treas., J. E. Nelson, Box 1214, Pittsburgh, Pa.
Gen. Supt., E. T. Gatrell, Box 661, Tulsa, Okla.
Asst. Gen. Supt., J. N. Hunter, Box 661, Tulsa, Okla.
Div. Supt., W. M. McDermott, Box 661, Tulsa, Okla.; J. R. Murphy, Box 661, Tulsa, Okla.
Ch. Dispatcher, H. G. Bard, Box 661, Tulsa, Okla.
Mas. Mec., R. E. Trumbull, Box 661, Tulsa, Okla.

Gulf Pipe Line Co. of Pennsylvania, Tulsa, Okla.
Chm. Bd., J. F. Drake, Box 1214, Pittsburgh, Pa.
Pres., F. A. Leovy, Box 1214, Pittsburgh, Pa.
V. P.'s, E. C. Bothwell, Box 1214, Pittsburgh, Pa.; Rush Greenslade, Box 661, Tulsa, Okla.
V. P. and Comptroller, H. A. Gidney, Box 1214, Pittsburgh, Pa.
Asst. to V. P., P. H. Bohart, Box 661, Tulsa, Okla.
Sec., W. J. Guthrie, Box 1214, Pittsburgh, Pa.
Treas., J. E. Nelson, Box 1214, Pittsburgh, Pa.
Gen. Supt., E. T. Gatrell, Box 661, Tulsa, Okla.
Asst. Gen. Supt., J. H. Hunter, Box 661, Tulsa, Okla.; W. O. James, Box 167-A, R.R. No. 1, Cambridge City, Ind.; P. L. Reichard, Box 307, Springfield, Mo.

Gulf Pipe Line Co., Gulf Bldg., Pittsburgh, Pa.
Chm. Bd., J. F. Drake.
Pres., F. A. Leovy.
V. P.'s, E. C. Bothwell, Underwood Nazro, Drawer "C," Houston, Tex.; E. C. Kincade, Drawer "C," Houston, Tex.
Vice Pres. and Comptroller, H. A. Gidney.
Sec., W. J. Guthrie.
Treas., J. E. Nelson.

Gulf Oil Corp. of Pennsylvania, Gulf Bldg., Pittsburgh, Pa.
Chm. Bd., W. L. Mellon.
Pres., J. F. Drake.
Vice Chm. Bd., F. A. Leovy.
V. P. and Gen. Counsel, H. L. Stone.
Sec., W. J. Guthrie.
Treas., J. E. Nelson.

Union Gulf Corp., Gulf Bldg., Pittsburgh, Pa.
Chm. Bd., W. L. Mellon.
Pres., J. F. Drake.
Vice Chm. Bd., F. A. Leovy.
V. P. and Gen. Counsel, H. L. Stone.
Sec., W. J. Guthrie.
Treas, J. E. Nelson.

Gulf Pipe Line Co. of Pennsylvania, Gulf Bldg., Pittsburgh, Pa.
Chm. Bd., J. F. Drake, Box 1214, Pittsburgh, Pa.
Pres., F. A. Leovy, Box 1214, Pittsburgh, Pa.
V. P.'s, E. C. Bothwell, Box 1214, Pittsburgh, Pa.; Rush Greenslade, Box 2044, Tulsa, Okla.
Sec., W. J. Guthrie, Box 1214, Pittsburgh, Pa.
Treas., J. E. Nelson, Box 1214, Pittsburgh, Pa.
V. P. and Comptroller, H. A. Gidney, Box 1214, Pittsburgh, Pa.
Gen. Counsel, H. L. Stone, Box 1214, Pittsburgh, Pa.
Gen. Supt., E. T. Gatrell, Box 2044, Tulsa, Okla.

H

Hancock Oil Co. of California, Box 579, Security Bldg., Los Angeles, Calif.
Pres., W. J. Reid.
V. P., George Williams.

Mgr., W. T. Hancock.
Ref. Supt., H. D. Tupper.
P. L. Supt., L. C. De Harte.

Hill Pipe Line Co., Sand Springs, Okla.
Pres., E. M. Monsell.
Supt., M. L. Bond.
Auditor, A. G. McDonald.

Home Pipe Line Co., Cushing, Okla.
Pres. and Gen. Mgr., Andrew W. Little.
V. P., L. D. Gaunt.
Supt. and Gas Egr., Harry T. Eagle.
Miles of pipe lines owned or operated, 12¼.

Humble Pipe Line Co., Houston, Tex.
Pres., R. V. Hanrahan.
V. P. and Gen. Supt., J. A. Neath.
Sec. and Asst. Treas, J. M. Monaghan.
Treas., C. D. Voss.
Comptroller, N. V. Truly.
Asst. Sec., C. C. Moore.
Supt., T. R. Hanrahan, H. G. Mobley.
Ch. Egr., H. M. Stevenson.
Mech. Egr., O. Q. Lomax.
Civil Egr., J. C. Robertson.
Pur. Agt., H. M. Lingle.
Supt Tel. & Tel., R. M. Bayless.
Supt. Tankage, J. B. Harvey.
Mas. Mec., J. W. Holtz.
Supt. Right of Way, Gus Kellog.
Auditor, S. G. Loy.
Oil Dept., G. P. Martin.
Ch. Warehouseman, F. L. Statler.
Main Line Foreman, R. G. Gofner.
Welding Foreman, E. D. Brown.
Station Const. Foreman, Kirk Newton.
Supt. Terminals, H. C. Evans.
Paint Supt., H. E. Stilwell.
Div. Supt., F. D. McMahon, Box 712, Cisco, Tex.; J. W. Thomas, Box 712, Cisco, Tex.; W. L. Howard, 2023 Smith-Young Tower, San Antonio, Tex.; J. C. Hanrahan, Box 351, Longview, Tex.
Asst. Div. Supt., G. A. Lee, Box 577, McCamey, Tex.
Dist. Foremen, M. C. Foley, Box 351, Longview, Tex.; W. A. Hugg, Box 36, Mexia, Tex.; J. I. Anderson, Baytown, Tex.; J. R. Cornell, Box 11, Hull, Tex.; F. L. Clements, Box 723, Luling, Tex.; H. A. Neath, Box 698, Pampa, Tex.; G. W. Oliver, H.P.L. Co., Bruni, Tex.; I. F. Petty, Box 577, McCamey, Tex.; F. H. Slink, Bin "A," Wink, Tex.; F. O. Perry, West Columbia, Tex.; W. C. Price, Mineola, Tex.; J. E. Caffrey, Box 712, Cisco, Tex.

I

Indian Territory Illuminating Oil Co., Masonic-Empire Bldg., Bartlesville, Okla.
Pres., H. V. Foster.
V. P. and Gen. Mgr., Burdette Blue.
V. P. and Treas., C. H. Caldwell.
V. P., R. L. Gordon.
V. P. in charge of Production, A. V. Hoenig.
V. P.'s, W. A. Jones, 60 Wall St., New York; F. R. Coates, 60 Wall St., New York; H. O. Caster, 60 Wall St., New York.
Sec., E. B. Emenhiser.
Gen. Supt., C. O. Rison, Capitol Hill Sta., Oklahoma City, Okla.
Supt. Gas Dept., F. F. Finney.
Pur. Agt., H. D. Patridge.
Supt. Sales and Storage, G. V. N. Yates.
Asst. to V. P. in charge of Production, D. B. Dow, Box 4577, Oklahoma City, Okla.
Ch. Egr. and Consulting Egr., M. J. Kirwan.
Mgr. Land and Geol. Dept., D. L. Connelly.

Illinois Pipe Line Co., 539 South Main St., Findlay, Ohio.
Pres. and Gen. Mgr., Charles Bunje, Jr.
Treas., C. H. Gompf.
V. P.'s, J. C. Donnell 2d, J. H. Ferry, Box 592, Lima, Ohio; H. D. McCracken, Fort Worth, Tex.
Sec., O. F. Moore.
Pur. Agt., C. S. Sherk.
Ch. Egr., K. G. Creps, Montrose, Ill.; Harry Griffin, Martinsville, Ill.; C. E. Curts, Catlin, Ind.; H. D. Moore, Jamestown, Ind.; H. R. Foland, Elwood, Ind.; H. L. Ivins, Bluffton, Ind.; Elza Reed, Box 592, Lima, Ohio; Fred Brown, Harpster, Ohio; D. M. O'Connell, Perrysville, Ohio; S. S. Haskell, Sparta, Ohio; F. B. Whitman, Negley, Ohio; Ray Flick, Wood River, Ill.; C. H. Bricker, Sorento, Ill.; J. P. Bartlett, Brownstown, Ill.
Supt., A. H. Barber, Martinsville, Ill.; Walter Montgomery, Iraan, Pecos County, Texas; H. B. Trefs, Del Rio, Tex.; L. J. Yealy, Shelby, Mont.; E. A. Marshall, Box 592, Lima, Ohio.
Line Foreman, Oscar Jaco, Elwood, Ind.
Gen. Supt., W. D. Loftus, Bridgeport, Ill.; W. F. McCray, Owensboro, Ky.; P. W. Hennessy, Casper, Wyo.; R. N. Montgomery, Del Rio, Tex.
Foremen, E. H. Perry, Arp, Tex.; H. C. Warters, Robinson, Ill.; E. C. Welch, Bridgeport, Ill.
Miles of pipe lines owned or operated, 5,081.79.

Imperial Oil, Ltd., 56 Church St., Toronto 2, Canada.
Pres., G. H. Smith.
V. P.'s, C. A. Eames, R. V. LeSuer, L. C. McCloskey, J. McNeil.
Director, A. E. Halverson.
Sec. and Treas., F. E. Holbrook.
Egr., I. G. Wheaton.
Pur. Agt., L. E. Bury.
Asst. Pur. Agt., B. C. Kitchen, J. Shaw.

Imperial Pipe Line Co., Ltd., 56 Church St., Toronto, Ontario, Canada.
Pres., G. H. Smith.
V. P. and Gen. Mgr., D. O. Towl.
Director, L. C. McCloskey.
Supt., H. Wheatley, Wayne, Mich.

Iola Pipe Line Co., 1002 Old National City Bldg., Lima, Ohio.
Pres., E. L. Henton, Chelsea, Okla.
V. P., L. R. Ebling, Bartlesville, Okla.
Sec. and Treas., Harold Smith, Lima, Ohio.

K

Kendall Refining Co., Box 364, Bradford, Pa.
Pres. and Gen. Mgr., Otto Koch.
V. P., Joseph H. Bovaird.
V. P. and Asst. Gen. Mgr., Howard H. Greene.
Treas. and S. M., Irvine H. Shearer.
Sec., Asst. Treas., Pur. Agt., J. B. Fisher.
Ref. Mgr., E. E. Bown.
Process Supt., Francis Healy.
Field Supt., William Geibel.
Mech. Supt., Lon Crawford.
Asst. Field Supt., Cornell N. Pfohl, E. G. James.
W. M. Magee, P. L. Supt., Star Route.
Plant Egr., S. M. Wolbert.
Miles of pipe lines owned or operated, 92.

Keystone Pipe Line Co., 260 S. Broad St., Philadelphia, Pa.
Pres., J. W. Van Dyke.
V. P., W. M. Irish.
V. P., R. C. Tuttle.

L

La Salle Petroleum Co., 612 Wright Bldg., Tulsa, Okla.
Rec., Phil D. Williams, Box 995, Burkburnett, Tex.
Rec., W. J. Schnur.
Supt., William Gallagher, Quay, Okla.; Charles Fasholtz, Sedan, Kans.
Miles of pipe lines owned or operated, 108.

Leonard Petroleum Co., 48 North Main St., Washington, Pa.
Pres., John W. Leonard, 339 East Beau St., Washington, Pa.
V. P., John H. Donnan, Le Moyne Ave., Washington, Pa.

"Cheap" units
may cost too much

Many a cracking unit, installed because its first cost was cheap, has proved mighty expensive later on.

No matter how low the purchase price, any unit is costly if competitors take your business because the gasoline it makes is too long on knocking and too short on mileage.

Parsons does not build cheap cracking units. He designs and builds good cracking units based on the small refiner's needs—and mindful of his pocketbook.

Parsons-built Dubbs units have all the exclusive, time-tested Dubbs features—and Parsons' too.

Parsons-built Dubbs units are approved by Universal engineers and fully protected by Universal patents. They are guaranteed by Universal as well as by Parsons.

Would you like to know what Parsons can do for you?

It will cost nothing to find out.

PARSONS

THE RALPH M. PARSONS CO.
MT. VERNON, OHIO

Sec., D. R. Buchanan, 200 North Wade Ave., Washington, Pa.
Asst. Sec., S. E. Bryson, Duncan Ave., Washington, Pa.

Liberty Pipe Line Co., Gulf Bldg., Houston, Tex.
Pres., W. C. Averill, Jr.
V. P., Mills Cox.
Sec.-Treas., C. R. Ogilvie.
Ch. Egr., H. R. Bennett.
Supt., C. H. Lanier.

Lion Oil Refining Co., El Dorado, Ark.
Pres., T. H. Barton.
V. P.'s, M. E. Wilson, T. H. Martin.
Sec. and Atty., Jeff Davis.
Prod. and P. L. Supt., E. W. Hardage.
Asst. Treas., D. R. McKeithan.
Asst. Sec. and Asst. Treas., H. C. Osmond.
Treas., R. E. Meinert.
V. P. Ref. Div., J. J. Allison.

M

Magnolia Pipe Line Co., Box 900, Dallas, Tex.
Chm. Bd., E. R. Brown.
Pres., D. A. Little.
V. P. and Gen. Mgr., Ralph H. Kinsloe.
V. P. and Mgr. P. L., T. J. Fitch.
V. P. and Gen. Counsel, W. H. Francis.
V. P.'s, E. E. Plumly, M. J. McLaughlin, E. P. Angus, F. M. Lege, Jr.
Asst. Gen. Counsel, A. S. Hardwicke.
Treas. and Asst. Sec., W. L. Holmes.
Sec. and Comptroller, L. S. Sinclair.
Asst. Sec., J. V. Farnsworth.
Asst. Treas., R. J. Blackburn, W. E. Elliott, G. A. Young, Jr., Roland Martin, E. N. Johnson, W. H. Marchbanks, Guy L. Tate.
Asst. Treas. and Cash., W. H. Johnson.
Asst. Cash., G. L. Johnson.
Asst. Mgr., W. A. Sniffen, Box 900, Dallas, Tex.
Supt. Maintenance, A. R. Ehrhardt, Box 900, Dallas, Tex.
Asst. Supt. Maintenance, J. G. Norton, Box 900, Dallas, Tex.
Supt. Tel. and Tel. Dept., A. J. Balcom, Box 900, Dallas, Tex.
Div. Supt. Tel and Tel. Dept., H. H. Watson, Box 900, Dallas, Tex.
Elec. Egr., Tel. and Tel. Dept., D. H. Levy, Box 900, Dallas, Tex.
Oil Dispatcher, F. P. Childress, Box 900, Dallas, Tex.
Dist. Supt., J. L. Latimer, Box 454, Luling, Tex.; C. R. Swank, Box 1406, Shreveport, La.; J. H. Joy, Box 500, Tom Ball, Tex.; J. A. Smith, Box 29, Olden, Tex.; C. E. McGrew, Box 1418, Pampa, Tex.; L. A. Hancock, Box 1389, Longview, Tex.; J. J. McPolan, Box 900, Dallas, Tex.; E. W. Ticknor, Box 1726, Midland, Tex.; O. M. Joy, Box 971, Oklahoma City, Okla.; George Shaw, Box 1298, Drumright, Okla.; G. V. Copland, Box 591, Duncan, Okla.; C. J. Henniger, Box 368, Healdton, Okla.; A. T. Glover, Box 545, Wewoka, Okla.
Gen. Supt. Okla. P. L., C. R. Stewart, Box 971, Oklahoma City, Okla.
Div. Supt. Tel. and Tel. Dept., J. W. Hale, Box 971, Oklahoma City, Okla.
Miles of pipe lines owned or operated, 3,885.52.

Midwest Refining Co., Denver, Colo.
Pres., T. A. Dines, First National Bank Bldg., Denver, Colo.
V. P., Operations, G. H. Jaques, First National Bank Bldg., Denver, Colo.
Supt. P. L. Dept., G. M. Vandaveer, Casper, Wyo.
Ch. Egr., P. G. Weidner, Casper, Wyo.

N

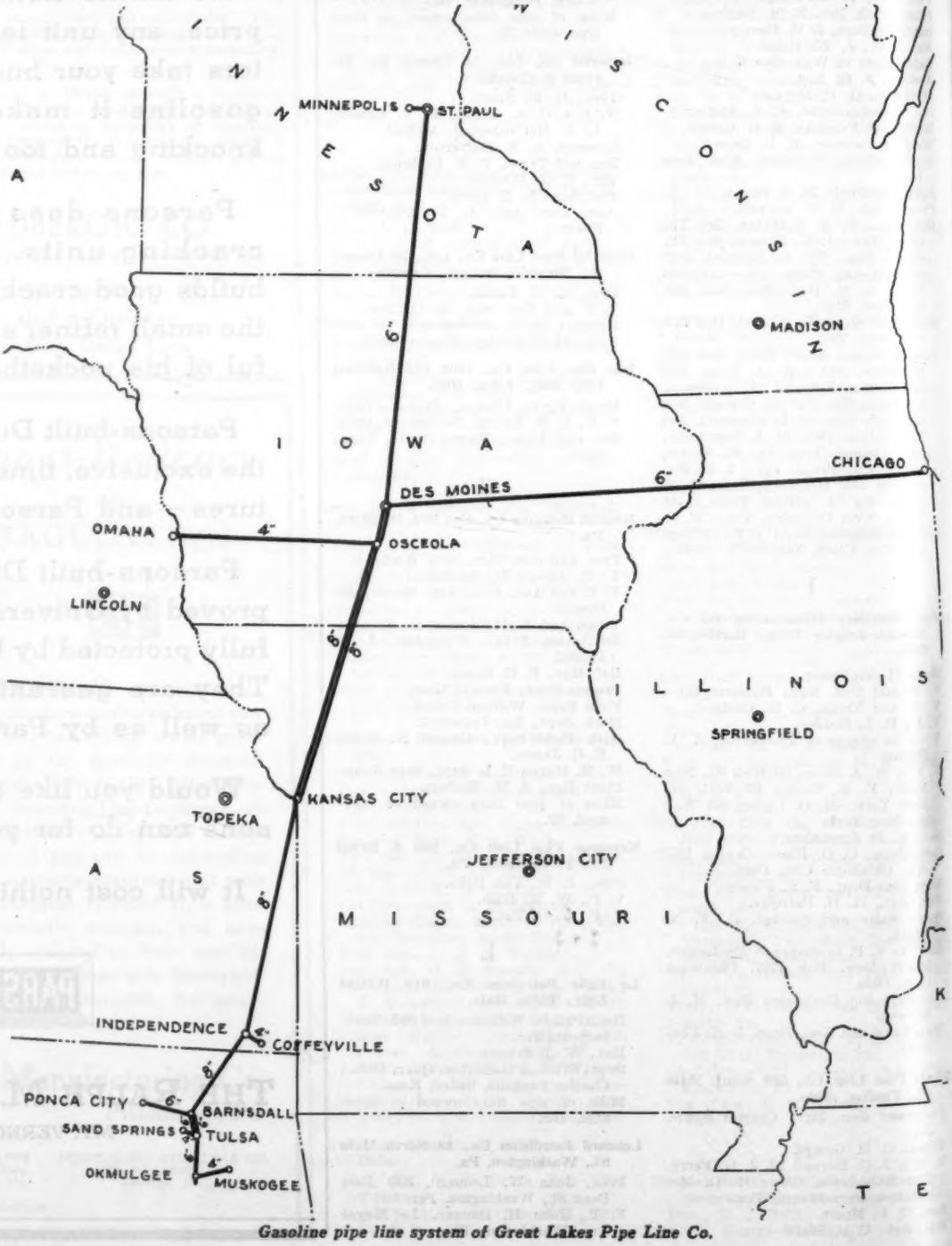
National Transit Co., 206 Seneca St., Oil City, Pa.
Pres., D. M. Sachs.
V. P. and Treas., L. C. Longaker.
Asst. Treas., J. H. Contino.
Sec., F. G. Zimmerman.
Auditor, C. T. McClintock.
Gen. Mgr., E. Fortmann.
Real Estate and Tax Agt., B. F. McMullen.
Pur. Agt., B. A. Bauer.
Miles of pipe lines owned or operated, 3,815.

Northern Group Pipe Lines, comprising Indiana Pipe Line Co., Buckeye Pipe Line Co., Northern Pipe Line Co., New York Transit Co.
New York Transit Co.
Pres., D. S. Bushnell, 26 Broadway, New York.
V. P. in charge of Operations, P. R. Applegate, 26 Broadway, New York.
Gen. Counsel, H. D. Bushnell, 26 Broadway, New York.
Sec., J. R. Fast, 26 Broadway, New York.
Treas., C. H. Cleaver, 26 Broadway New York.
Mgr. Real Est. and Tax Dept., B. A. Towl, 26 Broadway, New York.
Asst. Mgr. Real Est. and Tax Dept., A. B. Oakes, 26 Broadway, New York.
Ch. Egr., J. H. Peper, 26 Broadway, New York.
Fr. Traf. Mgr., R. J. Beatty, 26 Broadway, N. Y.
Pur. Agt., O. L. Nahouse, 26 Broadway, New York.
Oil Traf. Mgr., E. M. Welsh, 26 Broadway, New York.
Supt. of Tel., W. H. Flann, 206 Seneca St., Oil City, Pa.
Dist. Foreman, P. W. Geary, Olean, Cattaraugus County, New York.

Indiana Pipe Line Co.
V. P. and Gen. Mgr., R. A. Miller, Huntington, Ind.
Act. Supt., H. A. Somers, Jr., Huntington, Ind.
Asst. Sec., W. C. Shields, Huntington, Ind.
Oil Dispatcher, F. A. McClelland, Huntington, Ind.
Div. Egr., C. P. Williams, Huntington, Ind.

Buckeye Pipe Line Co.
V. P. and Gen. Mgr., T. B. Greene, 137 West North St., Lima, Ohio.
Asst. Gen. Mgr., W. H. Geddes, 137 West North St., Lima, Ohio.
Supt., G. E. Pifer, 137 West North St., Lima, Ohio; W. C. Ludwick, Marietta, Ohio.
Asst. Supt., F. M. Tinker, 137 West North St., Lima, Ohio.
Asst. Sec., G. P. Dildine, 137 West North St., Lima, Ohio; H. L. Pew, 137 West North St., Lima, Ohio.
Egr., E. L. Andrews, 137 West North St., Lima, Ohio; J. D. Bailey, 137 West North St., Lima, Ohio.
Oil Dispatcher, J. R. McNeff, 137 West North St., Lima, Ohio.
Dist. Foremen, D. W. McMahon, Bowling Green, Ohio; James June, Toledo, Ohio; F. R. Smith, Bremen, Ohio; R. E. Soules, Marietta, Ohio; Carl V. Shepard, Logan, Ohio; H. K. Floyd, Newark, Ohio.
Foremen of Gaugers, N. H. Fitzgerald, Findlay, Ohio; Grant Barbee, Marietta, Ohio.

Northern Pipe Line Co.
V. P. and Gen. Mgr., J. A. Bartlett, 206 Seneca St., Oil City, Pa.
Asst. Sec., J. P. Blackford, 206 Seneca St., Oil City, Pa.



Gasoline pipe line system of Great Lakes Pipe Line Co.

North American Oil & Gas Co.
Supt., C. J. Fowlston, 612 Rule Bldg., Amarillo, Tex.
Field Supt., W. O. Propst, Box 267, Skellytown, Tex.
Miles of pipe lines owned or operated, 25.

O

Ohio Oil Co., Findlay, Ohio.
Pres., O. D. Donnell.
V. P.'s, J. K. Kerr, Marshall, Ill.; John McFadyen, Casper, Wyo.; W. W. Fleming, Box 981, Tulsa, Okla.; C. L. Fleming, G. E. McCullough.
Sec., E. R. Redpath.
Treas., F. A. Billstone.
Gen. Counsel, A. M. Gee.
Pur. Agt., C. S. Sherk.
Ch. Egr., G. W. Uzzell.

Oklahoma Pipe Line Co., Box 801, Tulsa, Okla.
Pres., E. H. Leroux.
V. P. and Treas., Paul Griffin.
Sec., Charles Nelson, Jr.
Supt., R. W. Sparrowhawk, Bruce Ramsey, Box 337, Wewoka, Okla.
Ch. Egr., F. E. Warterfield, Jr.
Pur. Agt., H. P. Hellinghausen.
Special Oil Solicitor, T. M. Moroney.
Supt. of Tel., C. E. Foster.
Ch. Oil Dispatcher, H. S. Foote.
Dist. Foremen, A. E. Erickson, T. D. Walkley, Box 848, Cushing, Okla.; Reece Henry, Box 337, Wewoka, Okla.; George B. Randels, Box 967, Wilson, Okla.
Miles of pipe lines owned or operated: Trunk lines, 1,181.99; gathering lines, 876.49.

Old Dutch Refining Co., Rural Route No. 5, Muskegon, Mich.
Pres., John Borden.
V. P., G. S. Turner, Jr.
Sec., Willard G. Turner, Jr.
Treas., G. B. Treloar.
Asst. Sec. and Treas., F. H. Duggan.
Plant Supt., F. McCormack.
Chem., Clyde A. Cromwell.
Miles of pipe lines owned or operated, 18.

P

Panhandle Pipe Line Co., Amarillo, Tex.
Pres., R. E. Wertz.
V. P.'s, John Fertig, Independence, Kans.; F. E. Jones, Kansas City, Mo.; M. D. Snyder.
Sec.-Treas., George Baird, New York.
Asst. Sec.-Asst. Treas., H. R. Budke.
Ch. Egr., W. W. Rusk.
Supt., R. L. Dever.

Pawhuska Oil & Gas Co., Bartlesville, Okla.
Pres., H. V. Foster.
V. P., F. R. Coates, 60 Wall St., New York.
V. P. and Gen. Mgr., Burdette Blue, Box 1251, Bartlesville, Okla.
V. P. and Treas., C. H. Caldwell, Box 1251, Bartlesville, Okla.
V. P. and Counsel, R. L. Gordon, Box 1251, Bartlesville, Okla.
Sec., E. B. Emenhiser, Box 1251, Bartlesville, Okla.
Supt., F. F. Finney, Box 1251, Bartlesville, Okla.
Local Mgr., Charles Manney, Pawhuska, Okla.

Philadelphia Oil Co., 435 Sixth Ave., Pittsburgh, Pa.
Supt., R. F. Dolen, Clarksburg, W. Va.

Phillips Pipe Line Co., Bartlesville, Okla.
Pres., A. W. Hubbell.
V. P., R. E. Allen.
Sec. and Treas., W. E. Fowler.
Asst. Sec. and Treas., E. G. Hathaway.
Supt. of Line Maintenance, O. P. Miller, Kansas City, Mo.
Supt. of Communicating System, W. E. Smiley, Wichita, Kans.
Supt. Borger Terminal, E. L. Carter, Whittenburg, Tex.
Supt. Wichita Terminal, S. V. Montgomery, Wichita, Kans.
Supt. Kansas City Terminal, N. F. Farrell, Kansas City, Kans.
Supt. Jefferson City Terminal, E. H. Rasberry, Jefferson City, Mo.
Supt. St. Louis Terminal, E. L. Reed, East St. Louis, Ill.
Miles of trunk lines owned or operated, 764.

Preston Oil Co., 99 North Front St., Columbus, Ohio.
Pres., C. I. Weaver.
V. P.'s, T. H. Kerr, T. B. Gregory, W. L. McCloy.
Treas., E. D. Bivens.
Sec., P. A. Alberty.
Asst. Sec., P. A. Balliet.
Asst. Treas., P. A. Balliet, N. E. Shupe, J. E. Parsons.

Pure Oil Pipe Line Co., Pure Oil Bldg., 35 East Wacker Drive, Chicago.
Pres., C. B. Watson.
V. P.'s, A. C. Harvey, N. H. Weber, F. H. Bowman.
Sec.-Treas., C. H. Jay.
Asst. Sec., Alvin Richards, 118 West Sixth St., Tulsa, Okla.; Miss H. R. Sauer, First National Bank Bldg., Pittsburgh, Pa.
Supt., Judd Weber, Muskogee, Okla.; D. E. Beach, Mount Pleasant, Mich.
Mgr. Tel. Dept., H. C. Miller.
Ch. Egr., D. E. Sullivan.
Ch. Accountant, G. K. Barney.
Gen. Counsel, A. C. Harvey.

Pure-Van Pipe Line Co., Pure Oil Bldg., Chicago.
Pres., C. B. Watson, 35 East Wacker Drive, Chicago.
V. P.'s, A. C. Harvey, 35 East Wacker Drive, Chicago; W. M. Averill, Goodhue Bldg., Beaumont, Tex.
Sec.-Treas., Rawleigh Warner, 35 East Wacker Drive, Chicago.
Asst. Sec.-Treas., C. H. Jay, 35 East Wacker Drive, Chicago; George W. Bowes, Goodhue Bldg., Beaumont, Tex.
Supt., R. H. Parr, Van, Tex.
Ch. Egr., D. E. Sullivan, 35 East Wacker Drive, Chicago.
Ch. Acct., G. K. Barney, 35 East Wacker Drive, Chicago.
Gen. Counsel, A. C. Harvey, 35 East Wacker Drive, Chicago.

R

Reagan County Purchasing Co., Inc., Fort Worth, Tex.
Pres., Barney Holland.
V. P., D. A. Richardson, Oklahoma City, Okla.
Asst. Sec.-Asst. Treas., Burney Braly.
Sec. and Treas., R. L. Roberts.
Field Supt., Neil Ballard, Texon, Tex.

Reed Oil Co., Lyman Bldg., Muskegon, Mich.
Pres. E. R. Swett, Occidental Hotel, Muskegon, Mich.
V. P., J. B. Reed, 443 Clay Ave., Muskegon, Mich.
Sec., C. N. Sessions, Union Bank Bldg., Muskegon, Mich.
Treas., W. H. Wilson, Union Bank Bldg., Muskegon, Mich.
Director F. E. McKee, R.F.D. No. 3, Muskegon, Mich.
Gen. Mgr., Pur. Agt., Field Supt., C. B. Hoffman, 238 Lyman Bldg., Muskegon, Mich.
Miles of pipe lines owned or operated, 3½.

Richfield Oil Co. of California, Richfield Bldg., 555 South Flower St., Los Angeles, Calif.
Federal Equity Rec., William C. McDuffie.
Mgr. P. L. Dept., A. M. Kelley.
Supt., A. H. B. Gore.
Miles of main and gathering pipe lines owned or operated total 465, and consist of 8 miles of 2-inch, 22 miles of 3-inch, 90 miles of 4 to 5-inch, 96 miles of 6-inch, 101 miles of 8-inch, 140 miles of 10-inch, and 8 miles of 12-inch.

ABOVE: W-K-M Model "B" Pipe Cleaning Machine which will clean either stationary or traveling.

RIGHT: Johns-Manville Wrapping Machine and Gardiner Coating Machine.

LOW COST RECONDITIONING

with these cleaning, coating and wrapping machines

Careless preparation of the pipe and slip-shod application of protective coatings have, in the past, resulted in the actual waste of large sums of money on pipe line reconditioning work. Unless this work is done with exacting care, it had as well be left undone. To obtain genuine protection, we recommend:

1. **A clean pipe surface. (Best and cheapest obtained by W-K-M Pipe Cleaning Machines.)**
2. **Coating uniformly thick and relatively free from pinholes. (By Gardiner Coating Machine which saves formerly wasted material.)**
3. **Wrapping of Johns-Manville asbestos pipe line felt by J-M Wrapping Machines. (Faster, cheaper, and tighter than hand wrapping.)**

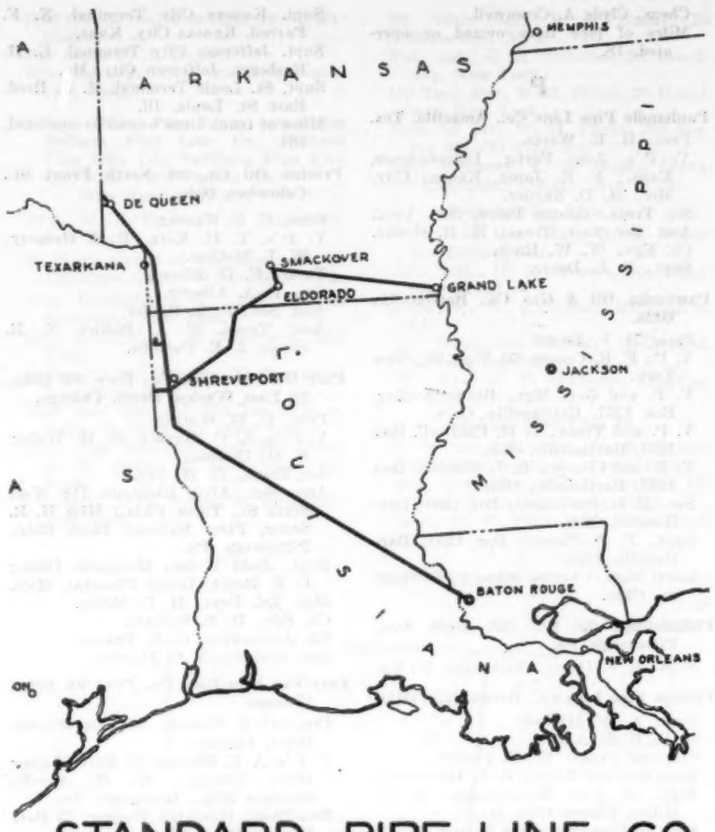
CRUTCHER-ROLFS-CUMMINGS-INC.
Specializing in
PIPE LINE EQUIPMENT AND MATERIALS
HOUSTON, TEXAS U.S.A.

Root Refining Co., Commercial National Bank Bldg., Shreveport, La.
Pres., D. P. Hamilton.
V. P., H. Canon.
Treas., L. C. Hallonquist.
Sec. and Pur. Agt., T. E. Beaird.
Sales Mgr., D. A. Brown.
Traf. Mgr., R. L. Aycock, El Dorado, Ark.
Ref. Supt., E. N. Kimes, El Dorado, Ark.
Ch. Egr., R. T. Colquette, El Dorado, Ark.
Geologist, J. C. Thompson, El Dorado, Ark.
P. L. and Prod. Mgr., Geo. G. Moore, Longview, Tex.

S

Simms Oil Co., 1007 Magnolia Bldg., Dalas, Tex.
Pres., Edward T. Moore.
V. P., F. R. Schneider.
Sec., L. W. Richards.
Treas., D. H. Voss.
Ref., Supt., A. G. Davis.
Pur. Agt., W. J. Morrison.
P. L. Supt., M. J. Grogan.
Ref. Supt., I. H. Lants.
Ch. Egr., Frank Gardner.
Miles of pipe lines owned or operated, 67½.

Shell Oil Co., 100 Bush St., San Francisco, Calif.
Pres., S. Belither, 100 Bush St., San Francisco, Calif.
V. P. and Treas., D. Heggie, 100 Bush St., San Francisco, Calif.
V. P., Dr. E. F. Davis, 1008 West Sixth St., Los Angeles, Calif.
V. P., E. L. Miller, 100 Bush St., San Francisco, Calif.
V. P., A. E. LaCombe, 100 Bush St., San Francisco, Calif.
V. P., J. U. Stair, 1008 West Sixth St., Los Angeles, Calif.
Sec., A. R. Bradley, 100 Bush St., San Francisco, Calif.
Asst. Treas., G. W. Wilde, 100 Bush St., San Francisco, Calif.



STANDARD PIPE LINE CO.

Engr., H. H. McQueen, 1008 West Sixth St., Los Angeles, Calif.
Ref. Supt., F. B. Simms, 1008 West Sixth St., Los Angeles, Calif.
Ref. Supt., D. F. Purdy, Coalinga, Calif.
Ref. Supt., D. M. Day, Martinez, Calif.
Ref. Supt., C. O. F. Jenkin, Wilmington, Calif.
Pur. Engr., J. C. Storey, 100 Bush St., San Francisco, Calif.

Shell Pipe Line Corp., Shell Bldg., St. Louis, Mo.
V. P., R. P. Bascom, Drawer 36, St. Louis, Mo.
Mgr., R. F. Smith, Drawer 36, St. Louis, Mo.
Pur. Agt., C. B. Singleton, Drawer 36, St. Louis, Mo.
Asst. Pur. Agt., L. C. Murphy, Drawer 36, St. Louis, Mo.
Supt. Tel. and Tel., F. S. Leonard, Drawer 36, St. Louis, Mo.
Div. Supt. Tel. and Tel., S. A. Lesnett, Drawer 36, St. Louis, Mo.; F. D. Morgan, Box 1191, Tulsa, Okla.; E. C. Morris, Drawer 318, Houston, Tex.
Supt., W. H. Shelley, Box 616, Harristown, Ill.
Gen. Supt., A. K. Riddle, Box 1097, Cushing, Okla.
Asst. Supt., L. F. Young, Box 1097, Cushing, Okla.; W. N. LeSueur, Box 1097, Cushing, Okla.
Div. Supt., P. J. Williams, Box 97, Neosho, Mo.; W. B. Sanders, Box 1097, Cushing, Okla.; R. Floyd, Box 1074, Seminole, Okla.; E. A. Dierdorff, Box 1028, Colorado, Tex.; D. H. Lewis, Box 1028, Kilgore, Tex.
Asst. Div. Supt., H. M. Hovis, Drawer 637, McCamey, Tex.
Supt., C. C. Ingram, Drawer 318, Houston, Tex.
Maintenance Supt., C. W. Marquis, Drawer 318, Houston, Tex.

Simrall Pipe Line Corp., Mount Pleasant, Mich.
Pres., C. L. Maguire, Box 168, Mount Pleasant, Mich.
V. P., T. F. Caldwell, Box 168, Mount Pleasant, Mich.
Sec. and Treas., S. M. Fasquelle, Box 168, Mount Pleasant, Mich.
Asst. Treas., R. Haynes, Box 168, Mount Pleasant, Mich.

Valves *for pipe lines*

KENNEDY Valves can always be depended upon to close tightly, release promptly at the first turn of the valve wheel, and to open or close without sticking or binding whether operated frequently or at long intervals.

The large Kennedy line includes a suitable size and type for practically every oil and gas industry requirement at 400-lb., 700-lb., 1000-lb. and 1600-lb. pressure, and also for lower pressures and for extreme pressures up to 2500-lb.

Kennedy Malleable Iron Screwed Pipe Fittings, too, are thoroughly reliable and will help to speed up your pipe-fitting jobs.

The Kennedy Valve Mfg. Co., Elmira, N. Y.
Warehouses and Representatives in principal cities.

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KENNEDY
VALVES-PIPE FITTINGS-FIRE HYDRANTS

Asst. Sec., E. Allan Morrow, Box 168, Mount Pleasant, Mich.
Supt., T. R. Russell, Box 168, Mount Pleasant, Mich.
Miles of pipe lines owned or operated, 65.

Sinclair Prairie Pipe Line Co., Independence, Kans.

Chm. Bd., C. H. Kountz.
Pres., J. R. Manion, Box 460, Independence, Kans.
Sec. and Treas., R. B. Hanna, Box 460, Independence, Kans.
Gen. Supt. of Trunk Lines, J. F. Blake, Box 418, Tulsa, Okla.
Gen. Supt., J. J. Linehan, Box 418, Tulsa, Okla.; C. E. McPoland, 1412 Commerce Bldg., Kansas City, Mo.
Supt. of Stations, T. E. Parrott, Box 418, Tulsa, Okla.
Supt. of Highway Equip., C. E. Earle, Box 418, Tulsa, Okla.
Div. Supt., M. J. Loftus, Box 460, Independence, Kans.; R. J. Tibbetts, 533 First National Bank Bldg., Wichita, Kans.; J. D. Moroney, Box 1249, Bartlesville, Okla.; W. F. Conry, Box 418, Tulsa, Okla.; W. E. Morrison, Box 391, Shawnee, Okla.; L. H. Angove, Box 248, Bowie, Tex.; J. J. Stines, 1412 Commerce Bldg., Kansas City, Mo.; F. McFarland, Mexico, Mo.; R. B. Laughner, 414 Bondi Bldg., Galesburg, Ill.
Ch. Egr., C. R. Weidner, Box 460, Independence, Kans.
Ch. Oil Disp., G. E. Beatty, Box 460, Independence, Kans.
Supt. Right of Way, W. R. Flanagan, Box 460, Independence, Kans.
Auditor, K. L. Laufman, Box 460, Independence, Kans.
Pur. Agt., H. A. Woodard, Box 521, Tulsa, Okla.

Sinclair Prairie Pipe Line Co. (of Texas).

Pres., J. R. Manion, Box 460, Independence, Kans.
Sec. and Treas., R. B. Hanna, Box 460, Independence, Kans.
Asst. to Pres., Charles Fitzgerald, Box 1990, Fort Worth, Tex.
Gen. Supt., A. D. Sloan, Box 1990, Fort Worth Tex.
Div. Supt., Leo B. Smith, Box 1430, Wichita Falls, Tex.; C. E. Christie, Box 711, Mexia, Tex.; H. Wallender, Box 748, Troup, Tex.; C. O. Shields, Box 1265, Borger, Tex.

Sinclair Union Pipe Line Co., Inc., Wellsville, N. Y.

Pres., George H. Taber, Jr., 45 Nassau St., New York.
V. P.'s, John P. Herrick, First National Bank, Olean, N. Y.; O. W. Walchli, Riverside, Wellsville, N. Y.
Treas., H. L. Temple, South Main St., Wellsville, N. Y.
Sec.. O. W. Walchli, Riverside, Wellsville, N. Y.
Supt., W. M. Wright, South Brooklyn Ave., Wellsville, N. Y.
Agt., H. L. McCarn, Scott Ave., Wellsville, N. Y.

Skelly Oil Co., Eldorado, Kans.

P. L. Supt., S. G. Snyder.
Dist. Foreman, Madison Dist., G. E. Ault.
Connection Foreman, Eldorado Dist., H. Wolf.
Connection Foreman, Eldorado Dist., D. O. Confer.
Connection Foreman, Western Dist. (McPherson and Cunningham), S. Cannon.
Supt.'s Clerk and Strapper, Rex. L. Smith.
Oil Disp., D. A. Kemmerly.
Crude Pur. Agt., Robert Pielsticker.
Miles of pipe lines owned or operated, 420.

Southern Pipe Line Co., 26 Broadway, New York.

Chm. Bd., Forrest M. Towl, New York.
Pres., Allan T. Towl, New York.
V. P. and Treas., J. M. Tussey, Oil City, Pa.
V. P. and Gen. Mgr., Theo. C. Towl, Pittsburgh, Pa.
Sec., E. W. Ziegler, Oil City, Pa.
Director, J. F. Burgess, Oil City, Pa.
Gen. Supt., L. J. Vandergrift, Lancaster, Pa.

South Penn Oil Co., Chamber of Commerce Bldg., Pittsburgh, Pa.

Pres., P. H. Curry.
V. P.'s, F. J. Huffman, C. B. Turner.
Sec., John L. Hays.
Treas., S. G. Hartman.
Asst. Treas., E. W. Kartlick.
Gen. Mgr., Charles F. Stevenson.
Ch. Chem., H. J. Little.
Pur. Agt., W. P. Wissner.
Ch. Egr., H. J. Little.

South West Pennsylvania Pipe Lines, 26 Broadway, New York.

Chm. Bd., Forrest M. Towl, New York.
Pres., Allan T. Towl, New York.
V. P. and Treas., J. M. Tussey, Oil City, Pa.
V. P. and Gen Mgr., Theo. C. Towl, Pittsburgh, Pa.
Sec., E. W. Ziegler, Oil City, Pa.
Directors, R. L. Cronise, Pittsburgh, Pa.; D. L. Jolly, Washington, Pa.; W. H. Fisher, Pittsburgh, Pa.

Spartan Refining Co., Inc., Shreveport, La.

Same officers and directors as Atlas Pipe Line Co.
Owns and operates 80 miles of 8-inch line from Shreveport to El Dorado, Ark. Refinery at Shreveport.

Standard Pipe Line Co., Inc., Shreveport, La.

Pres., F. Ray McGrew.
V. P., S. W. Day.
Sec. and Treas., H. T. Austermell.
Asst. Sec. and Asst. Treas., A. B. Simmons, Baton Rouge, La.
Supt., J. A. Kunkle.
Dist. Foremen, S. R. Simmons, Bunkie, La.; T. F. Welsh, Route 5, Box 121, Mindan, La.; O. C. Day, Smackover, Ark.; Rex Thompson, Trees, La.; S. A. Sheppard, Zwolle, La.; R. E. Hughes, Oxford, La.
Asst. Dist. Foreman, J. G. Murchison, Bunkie, La.
Ch. Eng. Div., W. B. Fulton.
Asst. Ch. Eng. Div., H. J. Hanlon.
Mas. Mech., Francis Coryell.
Ch. Oil Disp., W. G. Kelly.
Auto Shop. Foreman, A. J. Curry.
Right of Way Foreman, D. B. Means.
Ch. Egr., J. F. Havard, DeQueen, Ark.; M. E. Luse, Ida, La.; A. L. Wallace, Route 2, Box 335, Shreveport, La.; F. J. Tunstead, Flora, La.; E. E. Wasson, Flora, La.; G. C. Hollaway, Melville, La.; W. M. Steele, Oxford, La.; J. A. Norwood, Bunkie, La.

Supt. Tel. and Tel., Morris Chambers.
Asst. Supt. Tel. and Tel., W. H. Massey.
Pur. Agt., W. C. Taylor.
Total miles of gathering and trunk lines owned and operated, 1,901.98.

Standish Pipe Line Co. (Oklahoma, Texas, Kansas, Arkansas).

Pres., E. F. Guidinger, Bartlesville, Okla.
V. P., J. R. Harris, Bartlesville, Okla.
Sec.-Treas., C. J. Logue, Bartlesville, Okla.
Supt. Okla. City Div., R. T. Conwell, Oklahoma City, Okla.
Supt. Seminole Div., Ed. A. Ralston, Seminole, Okla.
Supt. Burbank Div., T. W. Mazey, Kaw, Okla.
Supt. Panhandle, Tex., Div., C. J. Turner, Whittenburg, Tex.
Supt. Kans. Div., E. V. Kile, Eureka, Kans.
Supt. Ark. Div., F. M. Patterson, Smackover, Ark.
Miles of pipe lines owned and operated: Trunk, 574; gathering, 791.

Stanolind Pipe Line Co., Philcade Bldg., Tulsa, Okla.

Chm. Bd., E. G. Seubert, 910 South Michigan Ave., Chicago.
Pres., R. S. Ellison, Philcade Bldg., Tulsa, Okla.
V. P.'s, A. W. Peake, 910 South Michigan Ave., Chicago; B. P. Sibole, Philcade Bldg., Tulsa, Okla.
Sec.-Treas., A. L. Carlson, Philcade Bldg., Tulsa, Okla.
Asst. Sec.-Asst. Treas., C. J. Barkdull, 910 South Michigan Ave., Chicago; S. N. Potts, Philcade Bldg., Tulsa, Okla.
Gen. Counsel, Clay Tallman, Philcade Bldg., Tulsa, Okla.
Gen. Supt., W. G. Heltzel, Philcade Bldg., Tulsa, Okla.
Ch. Civil Egr. C. M. Scott, Jr., Philcade Bldg., Tulsa, Okla.
Auditor, J. L. Shoemaker, Philcade Bldg., Tulsa, Okla.
Pur. Agt., Wm. L. James, Philcade Bldg., Tulsa, Okla.
Traf. Mgr., J. L. Burke, Philcade Bldg., Tulsa, Okla.
Supt., Safety and Personnel, L. E. Jennings, Philcade Bldg., Tulsa, Okla.
Supt. Right of Way, S. M. Briscoe, Philcade Bldg., Tulsa, Okla.
Supt. Tel. and Tel., F. P. O'Connor, Philcade Bldg., Tulsa, Okla.
Ch. Oil Disp., Raymond Harvey, Philcade Bldg., Tulsa, Okla.

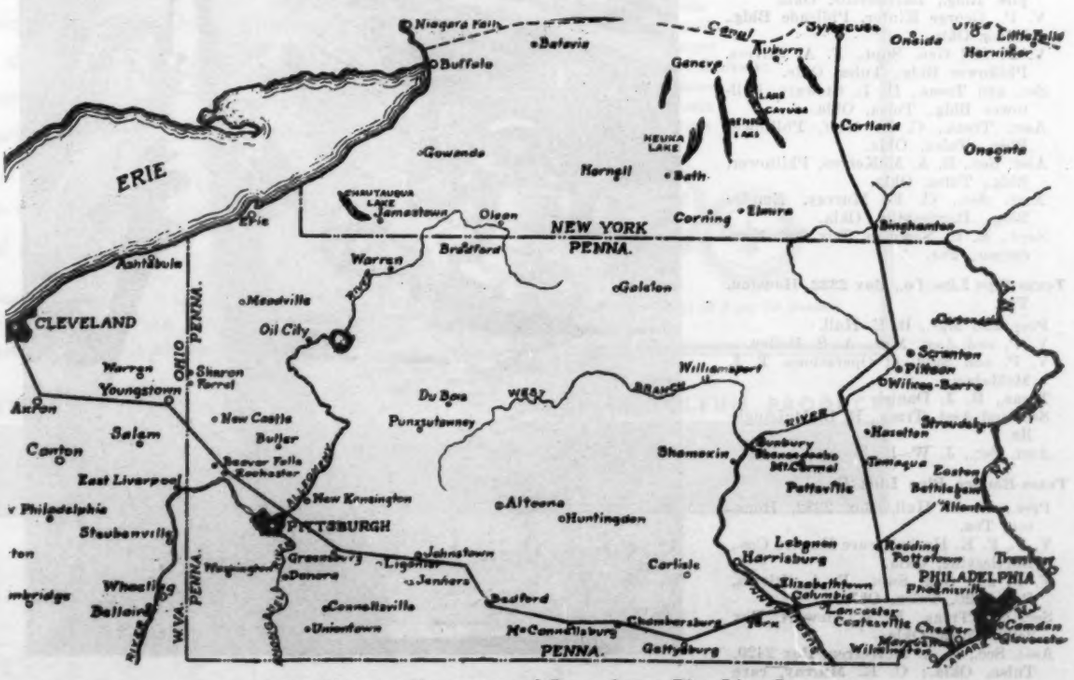
Mas. Mech., J. B. Harshman, Philcade Bldg., Tulsa, Okla.
Supt., Tankage, Eugene Moynihan, Philcade Bldg., Tulsa, Okla.
Supt., Welding, A. M. Hill, Philcade Bldg., Tulsa, Okla.
Lub. Egr., F. V. Cook, Philcade Bldg., Tulsa, Okla.
Ch. Gauger, Bert Martin, Philcade Bldg., Tulsa, Okla.
Supt., O. H. Powell, Box 1410, Fort Worth, Tex.; G. E. Ogilvie, Philcade Bldg., Tulsa, Okla.
Div. Supt., J. M. McNally, Box 1295, Oklahoma City, Okla.; J. E. Polston, 603 State National Bank Bldg., Shawnee, Okla.; C. W. Butler, 603 State National Bank Bldg., Shawnee, Okla.; John J. Hill, Box 1410, Fort Worth, Tex.; E. W. Young, Carrollton, Mo.; J. J. Cartmill, Carrollton, Mo.; J. E. Kirschner, Box 468, Humboldt, Kans.; G. R. Seymour, 304 Bondi Bldg., Galesburg, Ill.; D. T. Hawkins, 304 Bondi Bldg., Galesburg, Ill.
Dist. Foremen, J. W. Bowman, Box 895, Seminole, Okla.; C. A. Childers, Box 1295, Oklahoma City, Okla.; W. J. Bell, Box 468, Humboldt, Kans.; P. L. Chapman, Box 386, Ada, Okla.; Harry C. Jones, Box 576, Hominy, Okla.; C. F. Gray, Box 486, Nowata, Okla.; John Jaco, Box 206, Devol, Okla.; P. A. Hardman, Box 555, Bristow, Okla.; I. H. McVickers, Box 397, Bowie, Tex.; J. J. Dougherty, Box 945, Mexia, Tex.; J. W. Evertz, Box 747, Hutchinson, Kans.; W. S. Partner, Box 281, Kearney, Neb.
Line Foreman, J. C. Burch, Box 1410, Fort Worth, Tex.

Sun Pipe Line Co. (Texas), Beaumont, Tex.

Pres., J. Edgar Pew.
V. P.'s, J. N. Pew, Jr., R. W. Pack.
Sec.-Treas., Frank Cross.
Asst. Sec.-Treas., J. H. Harlan.
Supt. East Tex. Div., W. C. Kinsolving.
Directors, J. Edgar Pew, J. N. Pew, Jr., John G. Pew, Frank Cross, R. W. Pack.
Miles of pipe lines owned or operated, 234.

Sun Pipe Line Co. (Delaware).

Pres., J. N. Pew, Jr.
V. P., J. Edgar Pew.
Sec.-Treas., Frank Cross.
Directors, J. N. Pew, Jr., J. Edgar Pew, Frank Cross, J. Howard Pew, Arthur E. Pew, Jr.



Gasoline pipe line system of Susquehanna Pipe Line Co.

T

Texas Pipe Line Co. of Oklahoma, Tulsa, Okla.

Pres., J. K. McGoldrick, Box 2420, Tulsa, Okla.

V. P.'s, J. H. Hill, Box 2420, Tulsa, Okla.; B. E. Hull, Box 2332, Houston, Tex.

Sec. and Treas., H. L. Stewart, Box 2,420, Tulsa, Okla.

Asst. Sec. and Asst. Treas., C. D. Ruff, Box 2420, Tulsa, Okla.

Asst. Sec., R. B. McLaughlin, Box 2,332, Houston, Tex.

Supt. No. Div., T. F. Reagan, Box 2420, Tulsa, Okla.

Supt. So. Div., C. M. Shull, Box 125, Durant, Okla.

Dist. Foremen, J. J. Hanrahan, Okmulgee, Okla.; W. H. Moran, Box 637, Seminole, Okla.

Ch. Egr., J. L. Culbertson, Box 2332, Houston, Tex.

Supt. Oper., Tel. and Tel. Div., T. J. McMahon, Box 2332, Houston, Tex.

Ch. Oil Disp., W. A. Bohan, Box 2420, Tulsa, Okla.

Superv., C. & M., Tel. and Tel., J. H. Borchers, Box 2332, Houston, Tex.

Texas Co. (California).

Pres. and Gen. Mgr., C. E. Olmsted, 929 South Broadway, Los Angeles, Calif.

V. P.'s, J. A. Bermingham, 929 South Broadway, Los Angeles, Calif.; H. W. Dodge, 135 East Forty-second St., New York; R. T. Herndon, 929 South Broadway, Los Angeles, Calif.; L. R. Holmes, 929 South Broadway, Los Angeles, Calif.

Gen. Counsel, C. C. Stanley, 929 South Broadway, Los Angeles, Calif.

Sec., E. M. Crone, 135 East Forty-second St., New York.

Treas., C. E. Woodbridge, 135 East Forty-second St., New York.

Comptroller, Ira McFarland, Box 233, Houston, Tex.

Asst. Sec., G. G. Walker, 929 South Broadway, Los Angeles, Calif.

Asst. Treas., W. D. Stewart, 929 South Broadway, Los Angeles, Calif.

Pur. Agt., C. W. Chandler, 929 South Broadway, Los Angeles, Calif.

Texas-Empire Pipe Line Co. of Texas, Fifth St. and Boston Ave., Tulsa, Okla.

Pres., H. R. Straight, Empire Bldg., Bartlesville, Okla.

V. P. and Mgr., F. K. Haskell, Empire Bldg., Bartlesville, Okla.

V. P., George Kinter, Philcade Bldg., Tulsa, Okla.

V. P. and Gen. Supt., F. A. Stivers, Philtower Bldg., Tulsa, Okla.

Sec. and Treas., H. L. Stewart, Philtower Bldg., Tulsa, Okla.

Asst. Treas., C. D. Ruff, Philtower Bldg., Tulsa, Okla.

Asst. Sec., B. A. McKerren, Philtower, Bldg., Tulsa, Okla.

Asst. Sec., C. E. Murray, Empire Bldg., Bartlesville, Okla.

Supt., E. L. Newman, Box 606, Henderson, Tex.

Texas Pipe Line Co., Box 2332, Houston, Tex.

Pres. and Mgr., B. E. Hull.

V. P. and Asst. Mgr., A. S. Bailey.

V. P. and Supt. of Operations, T. J. McMahon.

Treas., R. J. Daniel.

Sec. and Asst. Treas., R. B. McLaughlin.

Asst. Sec., J. W. Emison.

Texas-Empire Pipe Line Co.

Pres., B. E. Hull, Box 2332, Houston, Tex.

V. P., F. K. Haskell, care Empire Cos., Bartlesville, Okla.

V. P. and Gen. Supt., F. A. Stivers, Box 2420, Tulsa, Okla.

Sec. and Treas., H. L. Stewart, Box 2420, Tulsa, Okla.

Asst. Sec., B. A. McKerren, Box 2420, Tulsa, Okla.; C. E. Murray, care Empire Cos., Bartlesville, Okla.

Asst. Treas., C. D. Ruff, Box 2420. Tulsa, Okla.; R. L. Morton, care Empire Cos., Bartlesville, Okla.

Div. Supt., J. H. O'Brier, Box 664, Bloomington, Ill.; W. H. Shields. Box 2420, Tulsa, Okla.

Ch. Oil Disp., W. A. Bohan, Box 2420, Tulsa, Okla.

Div. Foreman, A. G. Love, Box 62, Boonville, Mo.

Res. Civil Egr., N. H. Hilton, Box 2420, Tulsa, Okla.

Miles of pipe lines owned, 904.

Texas-Empire Pipe Line Co. of Texas.

Pres., H. R. Straight, care Empire Cos., Bartlesville, Okla.

V. P. and Mgr., F. K. Haskell, care Empire Cos., Bartlesville, Okla.

V. P. and Gen. Supt., F. A. Stivers, Box 2420, Tulsa, Okla.

V. P., George Kinter, Box 731, Tulsa, Okla.

Sec. and Treas., H. L. Stewart, Box 2420, Tulsa, Okla.

Asst. Sec., B. A. McKerren, Box 2420, Tulsa, Okla.; C. E. Murray, care Empire Cos., Bartlesville, Okla.

Asst. Treas., C. D. Ruff, Box 2420, Tulsa, Okla.

Supt., E. L. Newman, Box 606, Henderson, Tex.

Ch. Oil Disp., W. A. Bohan, Box 2420, Tulsa, Okla.

Note—This company was organized to own and operate the 12-inch line from East Texas to Port Arthur. In the company the Texas Corp. owns 37½ per cent; the Empire Gas & Fuel Co., 37½ per cent; and the Tide Water Oil Corp., 25 per cent. The line consists of 208 miles of 12-inch.

Texas Production Co., Esperson Bldg., Houston, Tex.

Pres. and Gen. Mgr., Ernest Cockrell.

V. P., W. D. Gordon, Gilbert Bldg., Beaumont, Tex.

Sec.-Treas., J. M. Sowarby.

Thurber Pipe Line Co., Thurber, Tex.

Pres., John Hancock, Fort Worth National Bank Bldg., Fort Worth, Tex.

Sec.-Treas., R. Seibel, Fort Worth National Bank Bldg., Fort Worth, Tex.

Supt., R. J. Fleckenstein, Fort Worth National Bank Bldg., Fort Worth, Tex.

Miles of pipe lines owned or operated, 99.1.

Tide Water Pipe Line Co., Ltd., 17 Battery Place, New York City, and Bradford, Pa.

Pres., H. F. Parsons, 17 Battery Place, New York.

V. P. and Gen. Mgr., C. W. Morrison, Box 155, Bradford, Pa.

Sec. and Asst. Treas., William J. Burker, 17 Battery Place, New York.

Treas., K. R. Hankinson, 17 Battery Place, New York.

Asst. Treas., J. Z. Van Tine, Box 155, Bradford, Pa.

Asst. Superv. Trunk Lines., E. W. Duggan, Box 155, Bradford, Pa.

In Charge of Machinery, L. C. Harding, Box 155, Bradford, Pa.

In Charge of Buildings, C. G. Grimsby, Box 155, Bradford, Pa.

Foremen, F. Andresen, Stoy, Ill.; J. L. Tomb, Coal City, Ind.; E. E. Smith, Brooklyn, Ind.; N. A. Nabal, Fountaintown, Ind.; J. D. Pass, Hagerstown, Ind.; C. L. Deeter, Covington, Ohio; K. A. Frick, Bellefontaine, Ohio; F. Alexander, Edison, Ohio; M. R. Hammel, Ashland, Ohio; W. H. Tomb, Clinton, Ohio; P. R. Castner, Warren, Ohio; W. A. Fry, Hadley, Pa.; F. N. Woodward, Titusville, Pa.; G. S. Brown, Clarendon, Pa.; H. A. Happle, Bixford, Pa.; M. E. Lignian, Coudersport, Pa.; H. Pass, Muncy, Pa.; E. F. Wayne, Shumans, Pa.; H. L. Brenckman, Weatherly, Pa.; J. B. Tomb, Changewater, N. J.

Miles of pipe lines owned or operated, 1,363.

Toronto Pipe Line Co., Fourteenth Floor, Philtower Bldg., Tulsa, Okla.

Pres., A. L. Ellsworth, Royal Bank Bldg., Toronto, Ontario.

V. P., J. C. Miller, Royal Bank Bldg., Toronto, Ontario.

Sec., R. M. Pitcher, Philtower Bldg., Tulsa, Okla.

Supt., C. M. Bryson, Box 689, Tyler, Tex.

Miles of pipe lines owned and operated, 115.

Welders at work on gas pipe line

Tuscarora Oil Co., Ltd., 3401 North Sixth St., Harrisburg, Pa.

Pres., E. J. Lewis.

V. P. and Supt., W. E. Beckner.

Sec. and Treas., Henry Hofmann.

Supt., B. M. Hildebrand.

Egr., J. W. deHoog.

Line Foreman, D. E. Cully, Myerstown, Pa.

Miles of pipe lines owned or operated: Gasoline division, Bayway, N. J., to Midland, Pa., 369.76; crude division, Negley, Ohio, to Cooks Ferry, Pa., 13.04; Center Bridge, Pa., to Bayway, N. J., 47.72.

U

Union Oil Co. of California, 617 West Seventh St., Los Angeles, Calif.

Pres., L. P. St. Clair.

Exec. V. P., R. D. Matthews.

V. P.'s, W. W. Orcutt, W. L. Stewart, Jr., P. M. Gregg.

Asst. V. P., A. C. Gailbraith.

Comptroller, G. H. Forster.

Asst. Comptroller, A. H. Hand, A. B. Mason.

Treas., J. M. Rust.

Asst. Treas., A. C. Marshall.

Asst., Sec., W. R. Edwards, A. W. Milford.

Dir. of Transp., William Groundwater.

Gen. Supt. No. Div., Lafe Tod, San Luis Obispo, Calif.

Supt. Los Angeles P. L., W. W. Hay, Brea, Calif.

Supt. Ventura P. L., G. W. Gosline, Santa Paula, Calif.

Miles of pipe lines owned or operated: Trunk lines, 631; gathering lines, 430.

V

Valvoline Pipe Lines, Box 924, Butler, Pa.

Chm. Bd., E. W. Edwards, Fifth and Butler, Cincinnati, Ohio.

Pres., Howard W. Edwards, Fifth and Butler, Cincinnati, Ohio.

V. P. and Gen. Mgr., C. J. Leroux, Fifth and Butler, Cincinnati, Ohio.

Mgr. of P. L., C. A. Karns, East Butler, Pa.

Mgr. of Ref., C. W. Luton, East Butler, Pa.

Sec., C. C. Gould, New York.

Vickers Petroleum Co., 201 W-K-H Bldg., Wichita, Kans.

Pres., J. A. Vickers.

V. P., C. L. Henderson.

Sec.-Treas., J. S. Wertz.

Ref. Supt., A. M. Schrepfer, Potwin, Kans.

Asst. Ref. Supts., Clarence N. Davis, R. N. Moore, Potwin, Kans.

Prod. Supt., John M. Little.

Land Supt., Perry Hanson.

Pur. Agt., H. G. Shaw.

W

White Eagle Oil Corp., 1400 Federal Reserve Bank Bldg., Kansas City, Mo.

Pres., R. R. Irwin.

Mgr. Ref. and P. L., E. C. Marshall.

Supt. P. L., H. K. Phipps, Wichita, Kans.

Miles or pipe lines owned or operated, 352.

Wolverine-Empire Refining Co., Oil City, Pa.

Chm. Bd., E. W. Chase.

Pres., C. H. Ellingwood.

V. P. and Sec., A. W. Scott.

V. P. and Treas., F. W. Baer.

Asst. Sec. and Asst. Treas., F. S. Smith.

Y

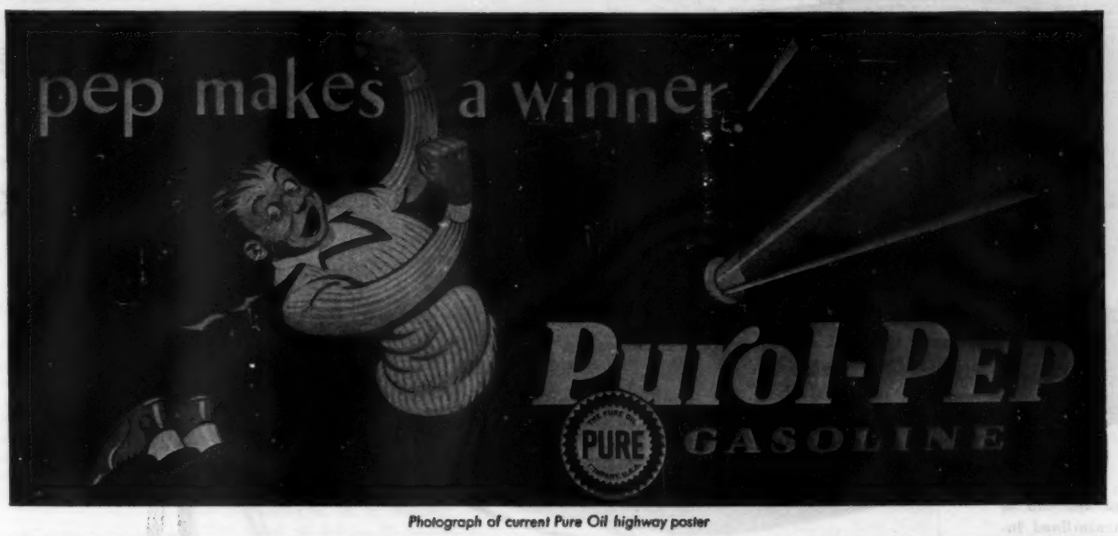
Yale Oil Corp., Yale, Okla.

Pres., L. B. Hancock, San Jose, Calif.

V. P., C. H. Gifford.

Sec.-Treas. and Mgr., F. B. Hancock.

Supt., Willard Shaw.



Photograph of current Pure Oil highway poster

PEP

Makes Business Good

● **In sports, in business, and in gasoline—Pep makes a winner. People like Purol-Pep (or its southern twin Woco-Pep) because it is chock full of get-away and go. Putting Pep into your business—into your tanks and into your service—makes business good.**

When you display the blue and white PURE seal sign you become an independent link in a great marketing chain which stretches over 32 states . . . you tie-in with over 15,000 other marketing outlets . . . you cash-in on the ready-made demand for Pure Oil gasolines, oils, and greases.

If you'd like to Pep Up your business ask about the Pure Oil proposition. Phone, write, or wire nearest sales office

PURE

REFINERIES:

Marcus Hook, Pennsylvania
Cabin Creek Jct., West Virginia
Heath, Ohio
Muskogee, Oklahoma
Smith's Bluff, Texas
Toledo, Ohio
Midland, Michigan

SALES OFFICES:

Chicago, Illinois
New York, New York
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Trenton, New Jersey
Columbus, Ohio
Norfolk, Virginia
Atlanta, Georgia
Minneapolis, Minnesota
Des Moines, Iowa
Tulsa, Oklahoma
Beaumont, Texas

Purol Pep — Tiolene

The Profit Twins of Pure Oil Dealers

PRODUCERS, REFINERS, MARKETERS OF A COMPLETE LINE OF PETROLEUM PRODUCTS

THE PURE OIL COMPANY ~ U. S. A.

INTERNATIONAL TRUCKS and McCORMICK-DEERING INDUSTRIAL TRACTORS

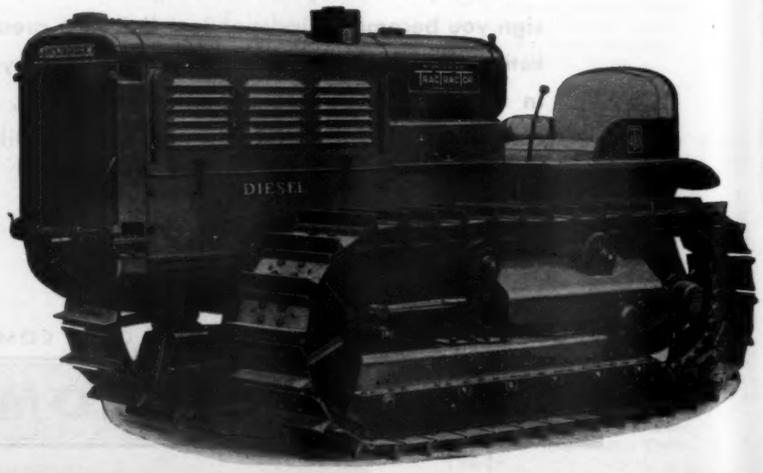
Built to Stand the Gaff on Pipe-Line Work or Any Other Job

Above: Front end and cab of one of the new streamlined International Trucks now ready in sizes from ½-ton up and chassis prices from $390 up, f.o.b. factory. These new models are already adding to International's reputation for quality and performance. Ask our nearest branch or dealer for a demonstration of these new trucks.

Above: An International Truck and McCormick-Deering Industrial Tractor stringing pipe along a right-of-way—a combination that provides speed, efficiency, and economy on the pipe line.

INTERNATIONAL TRUCKS and McCormick-Deering Industrial Tractors have long been identified with the oil industry—they can be counted among the pioneers in the development of many fields and in the growth of the pipe lines here and abroad. They had to be good, they had to have the stuff, to be able to stay in the oil business. They are the choice of the oil industry because they have proved their performance, their efficiency, their economy. They are backed up in their work by unusual after-sale service—no matter where these trucks and tractors work, you will always find a branch or dealer close by, ready to give you the best kind of service at any time. Get in touch with one of these, or write us, for prices, specifications, and other detailed information.

Below: The McCormick-Deering T-40 TracTracTor powered by a Diesel engine. This unit is also available with a 6-cylinder gasoline engine. The TracTracTor is the most accessible crawler tractor on the market. Steering clutches and brakes can be inspected, adjusted, or replaced through rear cover plates without disturbing tracks, track frames, or driving sprockets. For lighter work, there is the Model T-20 TracTracTor. The McCormick-Deering line also includes four sizes of wheel tractors; and three power units, including one with a Diesel engine.



INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. OF AMERICA (*Incorporated*) Chicago, Illinois

INTERNATIONAL HARVESTER

Personnel of Natural Gas Pipe Line Companies

A

American-Michigan Pipe Line Co., 372 Morris Ave., Muskegon, Mich.
Pres., C. N. Chubb, 105 West Adams St., Chicago.
V. P., Glenn R. Chamberlain, Grand Rapids Gas Light Co., Grand Rapids, Mich.
V. P. and Gen. Mgr., Dean W. Flowers, Muskegon Gas Co., Muskegon, Mich.
Treas., G. J. Zorn, Muskegon Gas Co. Bldg., Muskegon, Mich.
P. L. and Plant Supt., Harry Gabel, Muskegon Gas Co., Muskegon, Mich.
Miles of pipe lines owned and operated: Main line, 56; distribution, 110.

Argus Pipe Line Co., Dodge City, Kans. (Subsidiary of Northern Natural Gas Co.)
Dist. Mgr., Ted Stark.
Mgr., C. H. Smith, Hugoton, Kans.; H. E. Watts, Elkhart, Kans.; Pete Worman, Sublette, Kans.; Eber Roush, Cimarron, Kans.; R. E. Patterson, Meade, Kans.
Miles of pipe lines owned or operated: Transmission, 187; distribution, 60.

Arkansas Natural Gas Corp., Ardis Bldg., Shreveport, La.
Pres., Henry L. Doherty, 60 Wall St., New York, N. Y.
V. P., W. A. Jones, H. O. Caster, F. R. Coates, T. I. Carter, 60 Wall St., New York, N. Y.
V. P., J. R. Munce, Benedum-Trees Bldg., Pittsburgh, Pa.
V. P. and Gen. Mgr., D. W. Harris.
Gen. Supt., A. H. Weyland.
Sec., T. J. Heard.
Treas., B. R. Muirhead.
Asst. Sec., J. C. Hamilton.
Asst. Sec., L. E. Smith.
Asst. Sec., E. E. McWhiney, 60 Wall St., New York, N. Y.
Asst. Sec., C. B. Wedum, 60 Wall St., New York, N. Y.
Asst. Sec., T. A. Wallace, 60 Wall St., New York, N. Y.
Asst. Treas., J. W. Fulton.
Ch. Egr., H. T. Goss.
Pur. Agt., J. Lucas.

Aspen Mountain Gas Co., General and Operating Office, 45 South Main St., Salt Lake City, Utah.
Pres., L. B. Denning, Dallas, Tex.
V. P., Wendell Stephens, Findlay, Ohio.
V. P., J. D. Roberts.
Sec. and Asst. Treas., E. B. Redpath, Findlay, Ohio.
Asst. Sec. and Treas., F. B. Firmin, Findlay, Ohio.
Asst. Sec. and Asst. Treas., L. C. Olpin.
Asst. Sec., A. Baker, Casper, Wyo.
Asst. Treas., C. H. Gobrecht.
Pipe lines owned: 13.52 miles of 4-inch, 4.31 miles of 3-inch, 26.13 miles of city mains and services, all sizes.

B

Billings Gas Co., Billings, Mont
Pres., W. M. Holland, Box 120, Casper, Wyo.
Gen. Mgr., J. E. Moore.
Cash., C. A. Trowbridge.
Supt., J. B. McNamara.
Agts., I. O. Perl, Bridger, Mont.; A. J. Sholz, Laurel, Mont.

Brantford Gas Co., Brantford, Ontario.
V. P. and Gen. Mgr., S. B. Severson, 518 Jackson Bldg., Buffalo, N. Y.
Sec. and Treas., J. A. Richie, 518 Jackson Bldg., Buffalo, N. Y.
Asst. Sec., D. P. Spencer, 518 Jackson Bldg., Buffalo, N. Y.
Div. Supt., F. D. Howell, Brantford, Ontario.

C

Cabot, Godfrey L., Inc., 77 Franklin St., Boston, Mass.
First V. P., Ralph Bradley.
Treas., Thomas D. Cabot.
Mgr. W. Va. operations, C. A. Oakes.

Canadian River Gas Co., Gas Bldg., Amarillo, Tex.
Pl. Supt., W. A. Skinner.
Fld. Supt., R. W. Miller.
Gaso. Pl. Supt., H. F. Johnson.
Ch. Acct., E. E. Smith.
Gas Egr., Max K. Watson.
Gen. Supt., G. A. Woods.
Prod. Supt., R. A. Ford.
Gen. Mgr., Frank J. Trelease, P. O. Box 1087, Colorado Springs, Colo.

Canadian Western Natural Gas, Light, Heat & Power Co., Ltd., 215 Sixth Ave., W., Calgary, Alberta, Canada.
Pres. and Man. Dir., H. R. Milner.
V. P., E. W. Bowness.
Gen. Supt. and Ch. Egr., P. D. Mellon.
Egr., F. J. Heuperman.
Office Mgr. and Sec.-Treas., H. S. Watts.
New Business Dept., H. E. Timmins.
Geologist, S. E. Slipper.
Sup. of Acctg., F. A. Smith.
Acct., L. McPhee.
Ins. Dept., D. K. Yorath.
Pur. Agt., H. W. Francis.
Asst. Egr., W. J. Gray.
Fld. Supt., J. Morrison, care of Gas Company, Burdett, Alberta.
Main Line Supt., F. Harrison.
Dist. Supt., R. S. Winter, care of Gas Company, Lethbridge, Alberta.
Draughtsman, F. Paterson.
Const. Foremen, W. E. Larkham and E. Coleman.
Serv. Foreman, T. Dodds.
Sta. Oper., E. Horler.
Meter Sta. Oper., H. Patton, Turner Valley, Alberta.
Shop Supt., N. D. MacKinnon.
Main Line Supt., G. Robinson, Okotoks, Alberta.
Geologist, H. Hunter.
Geophysicist, J. E. Duncan.

Carnegie Natural Gas Co., Frick Bldg. Annex, Pittsburgh, Pa.
Pres., S. W. Meals.
V. P., MacGilvray Shiras.
Gen. Supt., H. J. Hess.
Div. Supt., Low Pres. Dist., H. A. Lowers, 24½ Harrison St., Mulhall, Pa.
Supt. West. Pa., T. J. White, Waynesburg, Pa.
Div. Supt., W. Va., Clarence Sweeney, Second Floor, P. O. Bldg., Mannington, W. Va.
Ch. Egr., N. K. Clements, Leechburg, Pa.
Auditor, H. L. Smith.
Asst. Auditor, F. H. Lydick.

Central Pipe Line Co., Chatham, Ontario.
Supt., M. Balcom, Vienna, Ontario.
Mgr., R. H. Owen.

Central States Power & Light Corp. of Delaware, Central States Power & Light Corp. of Oklahoma, Central States Production Corp. and Utilities Production Corp., 701 Oklahoma Bldg., Tulsa, Okla.
Pres., H. T. Pritchard, 327 S. LaSalle St., Chicago, Ill.
Gen. Mgr., B. F. Pickard.
Div. Mgr., W. F. Hebeler.
Auditor, H. L. Westphal.
Dist. Mgrs., M. P. Donahue, Henryetta, Okla.; Ray Heath, Stillwater, Okla.; Charles Rich, Clinton, Okla.; La Van Warren, Quinton, Okla., and J. W. Garman, Jr., Pampa, Tex.
Miles of pipe lines owned and operated in Oklahoma as of December 31, 1933, 738.92.

Cherokee Public Service Co., Wagoner, Okla.
Pres., M. B. Morgan.
Local Mgr., J. R. Johnston.
Egr., John McComic.
Supt., J. J. Cobb.
Miles of pipe lines owned or operated, 33.66.

Cimarron Utilities Co., Guymon, Okla.
Pres., Joseph F. Porter, 1330 Baltimore Ave., Kansas City, Mo.
Gen. Mgr., C. R. Stahl, Borger, Tex.
Asst. Gen. Mgr., L. J. Roberts.
Supt. and Ch. Egr., K. E. Sharp.
Asst. Sec. and Treas., L. L. Bobo.
Miles of pipe lines owned or operated, 202.3.

Cities Service Gas Co., Bartlesville, Okla.
Pres., H. L. Doherty, New York, N. Y.
V. P. and Gen. Mgr., H. R. Straight, Bartlesville, Okla.
V. P. and Mgr., H. L. Montgomery, Bartlesville, Okla.
V. P.s, A. W. Ambrose, Bartlesville, Okla.; T. I. Carter, New York, N. Y.; H. O. Caster, New York, N. Y.; F. R. Coates, New York, N. Y., and W. A. Jones, New York, N. Y.
Sec., C. E. Murray, Bartlesville, Okla.
Asst. Secs., T. P. Steeper, Bartlesville, Okla.; E. E. McWhiney, New York, N. Y., and C. B. Wedum, New York, N. Y.
Asst. Sec. and Asst. Treas., T. A. Wallace, New York, N. Y.
Treas., R. L. Morton, Jr., Bartlesville, Okla.
Asst. Treas., H. E. Butcher, Bartlesville, Okla.; Lloyd A. Lynd., Bartlesville, Okla., and V. B. Day, Chicago, Ill.
Directors, A. W. Ambrose, Bartlesville, Okla.; H. O. Caster, New York, N. Y.; F. R. Coates, New York, N. Y.; H. L. Doherty, New York, N. Y.; P. R. Jones, New York, N. Y.; W. A. Jones, New York, N. Y.; H. L. Montgomery, Bartlesville, Okla.; E. H. Johnston, New York, N. Y., and H. R. Straight, Bartlesville.
Mgr., H. L. Montgomery.
Supt. of Oper., George H. Baird.
Supt. of Pipe Line, H. B. Milam.
Supt. of Gas Prod., R. M. Stuntz.
Supt. of Comp. Stas., F. D. Renfro.
Supt. of Gas Meas., V. C. Jarboe.
Miles of pipe lines owned or operated, 4,273.5.

Citizens Pipe Line Co., Fort Smith, Ark., care of Harding Glass Co.
Pres., C. H. Harding.
V. P.s, W. E. Harding, W. L. Hinton, E. W. Young, F. L. Reese and Harry P. Lyman.
Sec. and Treas., Benjamin B. Johnston.
Supt., A. J. Burke.
Miles of pipe lines owned and operated, 17½.

Clayco Gas Co., Chamber of Commerce Bldg., 411 Seventh Ave., Pittsburgh, Pa.
Pres., P. H. Curry.
V. P., C. B. Turner.
Treas., S. G. Hartman.
Sec., J. L. Hays.
Asst. Sec., John E. Selden.

Coast Counties Gas & Electric Co., Alta Bldg., Santa Cruz, Calif.
Pres., H. L. Farrar.
V. P.s, W. H. Berg and R. W. Hanna.
Sec., B. W. Letcher.
Treas., V. F. Palmer.
Gen. Supt., A. E. Strong.
Gen. Adt. and Pur. Agt., R. N. Dreiman.
Ch. Egr., Charles Grunsky.
Sales Mgr., H. W. Edmund.

Colorado Interstate Gas Co., Colorado Springs, Colo.
Chm., N. K. Moody, Box 521, Tulsa, Okla.
Pres., H. C. Cooper, 545 Wm. Penn Way, Pittsburgh, Pa.
V. P.s, A. R. Jones, Land Bank Bldg., Kansas City, Mo., and F. H. Lerch, Jr., 30 Rockefeller Plaza, New York, N. Y.
Sec., E. E. Duvall, 30 Rockefeller Plaza, New York, N. Y.
Treas., F. H. Lerch, Jr., 30 Rockefeller Plaza, New York, N. Y.
Asst. Sec., James Comerford, 30 Rockefeller Plaza, New York, N. Y.
Asst. Treas., James Comerford, 30 Rockefeller Plaza, New York, N. Y.
Asst. Treas., J. O. Shields.
Managing Egrs., Ford, Bacon & Davis, Inc., 39 Broadway, New York, N. Y.
Egr. in Chrg., Frank J. Trelease.
Gen. Supt., J. P. McClintock.
Miles of pipe lines owned and operated, 435.

Columbia Engineering Corp., 99 North Front St., Columbus, Ohio.
Chm. Bd., George W. Crawford, 800 Union Trust Bldg., Pittsburgh, Pa.
Pres., C. I. Weaver, 99 North Front St., Columbus, Ohio.
V. Chm., P. G. Gossler, 61 Broadway, New York.
V. P., H. C. Blackwell, Fourth and Main Sts., Cincinnati, Ohio.
V. P. and Sec., E. Reynolds, Jr., 61 Broadway, New York.
V. P., Robert H. Delafield, 61 Broadway, New York.
V. P., T. B. Gregory, 800 Union Trust Bldg., Pittsburgh, Pa.
V. P., T. R. Weymouth, 61 Broadway, New York.
V. P., Don M. Wilson, 61 Broadway, New York.
Treas., F. B. Flahive, 61 Broadway, New York.
Asst. Sec., J. R. Harvin, 61 Broadway, New York.
Asst. Sec., H. H. Pell, Jr., 61 Broadway, New York.
Asst. Treas., Polk Laffoon, Fourth and Main Sts., Cincinnati, Ohio.
Asst. Treas., H. E. Olson, 61 Broadway, New York.
Aud., A. J. Newman, 800 Union Trust Bldg., Pittsburgh, Pa.
Res. Counsel, C. J. Gerkin, 61 Broadway, New York.
Director of Sales, B. H. Gardner, 99 North Front St., Columbus, Ohio.
Director of Pur., A. C. Moorhaus, Fourth and Main Sts., Cincinnati, Ohio.
Ins. Engr., F. H. Deckman, 99 North Front St., Columbus, Ohio.
Rate Engr., C. F. DeMey, 99 North Front St., Columbus, Ohio.
Chf. Engr. (Elec. Div.), C. W. De Forest, 314 West Fourth St., Cincinnati, Ohio.
Asst. Engr. (Elec. Div.), C. H. Spiehler, 314 West Fourth St., Cincinnati, Ohio.
Gas Engr., C. R. Bellamy, 61 Broadway, New York.
Appraisal Engr. (Gas Div.), L. E. Welker, 99 North Front St., Columbus, Ohio.
Gas Engr., H. M. Baker, Quarrier and Dunbar Sts., Charleston, W. Va.
Gas Engr., G. S. Young, 99 North Front St., Columbus, Ohio.
Meter Dept., J. E. Overbeck, 99 North Front St., Columbus, Ohio.
Inspection Dept., C. H. Lewis, 99 North Front St., Columbus, Ohio.

Columbia Gas & Electric Corp., 61 Broadway, New York, N. Y.
Chm. Bd., George W. Crawford, Pittsburgh, Pa.
Pres., Philip G. Gossler.
Exec. V. P. and Sec., Edward Reynolds, Jr.
V. P.s, Hubert C. Blackwell, Cincinnati, Ohio; Robert H. Delafield; Thomas B. Gregory, Pittsburgh, Pa.; Thomas R. Weymouth; Paul S. Clapp; Harry A. Wallace, Charles-

ton, W. Va., and C. I. Weaver, Columbus, Ohio.
Treas., Francis B. Flahive.
Asst. Secs., Jacob R. Harvin; David E. Mitchell, Pittsburgh, Pa.; Howland H. Pell, Jr., and George W. Ratcliffe, Pittsburgh, Pa.
Presidents, Charles E. Bennett, Binghamton Group Companies, Binghamton, N. Y.; Hubert C. Blackwell, Cincinnati Group Companies, Cincinnati, Ohio; C. I. Weaver, Columbus Group Companies, Columbus, Ohio; George W. Ratcliffe, Pittsburgh Group Companies, Pittsburgh, Pa.; Frank M. Tait, Dayton Group Companies, Dayton, Ohio; Harry A. Wallace, Charleston Group Companies, Charleston, W. Va., and D. M. Wilson, Seaboard Group Companies, New York, N. Y.
Miles of pipe lines owned and operated, 28,427.

Columbia Gas & Electric Corp.—Pittsburgh Group Companies—Cumberland & Allegheny Gas Co., Manufacturers Light & Heat Co., Natural Gas Co. of West Virginia, Pennsylvania Fuel Supply Co.,* Manufacturers Gas Co., Fayette County Gas Co. and Greensboro Gas Co., 800 Union Trust Bldg., Pittsburgh, Pa.

Chm. Bd., T. B. Gregory.
Pres., George W. Ratcliffe.
V. P. and Sec., D. E. Mitchell.
V. P.s, E. J. Egan and E. A. Clark.
Treas., W. P. Sadler.
Special Agt., W. H. Adams.
Pur. Agt., J. M. Simpson.
Industrial Gas Egr., T. E. Wood.
Merchandise Sales Mgr., W. L. Hutcheson.
Prod. Supt., Chester J. McMahan.
Distr. Supt., A. J. McClellan.
Asst. Distr. Supt., T. E. Hughes.
Trans. Supt., J. F. Nestor.
Asst. Trans. Supt., Earl D. Clutter.
Geologist, E. O. Schillhahn.
Ch. Egr., Mark L. Cowden.
*Pres., H. J. Crawford.
*V. P., George W. Ratcliffe.

Columbia Natural Gas Co., 545 William Penn Way, Pittsburgh, Pa.

Pres., J. B. Tonkin.
V. P., J. French Robinson.
Mgr., E. W. Williamson.
Asst. to Mgr., Christy Payne, Jr.
Field Supt., F. A. Benkert.
Supt. of Low Pres. Plants, L. E. Ostyre.
Mech. Egr., A. C. Perry.
Ch. of Map. Dept., Clyde E. Weitzel.

Columbus Gas & Fuel Co., 99 N. Front St., Columbus, Ohio.

Pres., C. I. Weaver.
V. P. and Gen. Mgr., E. M. Tharp.
V. P.s, T. H. Kerr; T. B. Gregory, 800 Union Trust Bldg., Pittsburgh, Pa.; J. M. Garard and H. H. Hall.
Treas., E. D. Bivens.
Sec., P. A. Alberty.
Asst. Sec. and Asst. Treas., P. A. Balliet.
Asst. Treas., E. C. Sharpe, N. E. Shupe and J. E. Parsons.

Community Natural Gas Co., 1915 Wood St., Dallas, Tex.

Pres., F. L. Chase.
V. P. and Sec., D. L. Cobb.
V. P. and Gen. Mgr., Chester L. May.
Treas. and Asst. Sec., H. G. Cornatzer.
Gen. Counsel, Garl F. Griffith.
Asst. Sec. and Asst. Treas., T. J. Uhl.
Asst. Secs., F. L. Richardson and W. A. Fisher.
Asst. Treas., L. B. Thaxton and C. J. Dardignac.
Comp., L. L. Dyer.
Gen. Supt., Eastern Div., L. B. Denning, Jr.
Gen. Supt., Western Div., M. L. Bird.
Ch. Egr., H. D. Portwood.
Supt. of Meter Maintenance, H. F. Preddy.
Div. Mgrs., K. D. Wolford, Bonham, Tex.; F. E. Benson, Greenville, Tex.; Joe Darrow, Itasca, Tex.; H. L. St. John, Marlin, Tex.; W. J. Deakins, Temple, Tex.; B. B. Stringfellow, Terrell, Tex.; C. C. Redding, Abilene, Tex.; A. P. Rowland, Brownwood, Tex.; F. V. Williams, Eastland, Tex.; R. H. Gray, Hamilton, Tex.; George Gott, Handley, Tex.; W. O. Anderson, Pilot Point, Tex.; L. M. Scholl, Sweetwater, Tex.; G. P. Williams, Electra, Tex.; C. C. Moore, Frederick, Okla., and J. H. Hodges, Sulphur, Okla.
Okla. Mgr., J. Y. Wheeler, Wynnewood, Okla.

Consumers Power Co., Consumers Power Bldg., Jackson, Mich.

Pres., T. A. Kenney, 20 Pine St., New York.
V. P. and Gen. Mgr., D. E. Karn.
Sec., Robert Davey.
Treas, C. E. Rowe.
Miles of pipe lines owned and operated, 50.

Creek Osage Gas Co., Sand Springs, Okla.

Pres., W. B. Head, Jr.
Sec. and Treas., G. W. Evans.
Supt., H. H. Young.
Miles of transmission pipe line owned, 31.9.

Cumberland Gas Corp.

Pres., Edwin L. Coyle, 50 Broadway, New York, N. Y.
V. P.s, J. A. Upham, Mount Vernon, Ohio; P. S. Koontz, Union Bldg., Charleston, W. Va.; H. B. Lambert, Union Bldg., Charleston, W. Va., and John C. Adams, 50 Broadway, New York, N. Y.
Sec., F. R. Hurlburt, Union Bldg., Charleston, W. Va.
Treas., C. F. Bauman, Union Bldg., Charleston, W. Va.

D

Dominion Natural Gas Co., Ltd., Jackson Bldg., Buffalo, N. Y.

V. P. and Gen. Mgr., S. B. Severson, 518 Jackson Bldg., Buffalo, N. Y.
Sec. and Treas., J. A. Richie, 518 Jackson Bldg., Buffalo, N. Y.
Asst. Sec., D. P. Spencer, 518 Jackson Bldg., Buffalo, N. Y.
Div. Supts., C. H. Lutz, Dunnville, Ontario.; C. M. Sieger, Hamilton, Ontario.

E

East Ohio Gas Co., 1405 East Sixth St., Cleveland, Ohio.

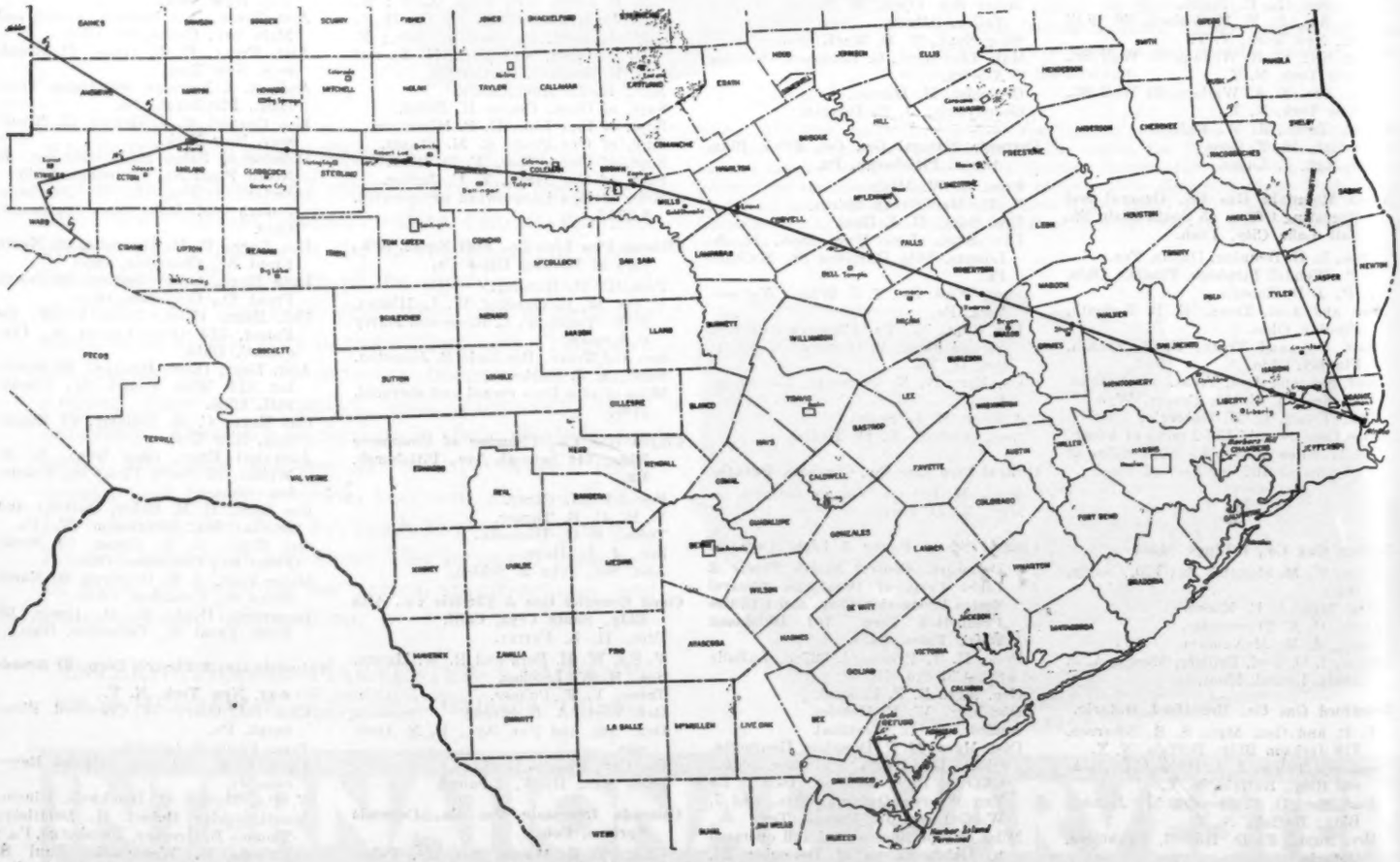
Pres. and Gen. Mgr., C. E. Gallagher.
V. P., John J. McMahon.
Sec. and Treas., W. G. Rogers.
Asst. Gen. Mgr., W. G. Hagan.
Gen. Supt., G. W. Horsley.
Asst. Gen. Supt., Karl Emmerling.
Supt. Field Dept., J. J. Schmidt.
Supt. Main Lines, S. W. Kiser, Canton, Ohio.
Supts., G. P. Binder, E. Sixty-second St. and St. Clair, Cleveland, Ohio; M. J. Murray, East Sixty-second and St. Clair, Cleveland, Ohio; W. H. Cummings, Wooster, Ohio; Okey Wheeler, Ohio Producing & Refining Co., Mount Pleasant, Mich.

El Paso Natural Gas Co., Tenth Floor, Bassett Tower, El Paso, Tex.

Pres., Paul Kayser, 906 Chronicle Bldg., Houston, Tex.
V. P. and Gen. Mgr., H. G. Frost, 906 Chronicle Bldg., Houston, Tex.
V. P. and Asst. Gen. Mgr., C. C. Cragin, 1010 Bassett Tower, El Paso, Tex.
Sec. and Treas., S. H. Benbow, 1020 Chronicle Bldg., Houston, Tex.
Asst. Sec. and Asst. Treas., J. E. Franey, 1010 Bassett Tower, El Paso, Tex.
Gen. Supt., A. L. Forbes, Jr., 1010 Bassett Tower, El Paso, Tex.
Industrial Egr., C. C. Tucker, 1010 Bassett Tower, El Paso, Tex.
Supt. of Meas., R. H. Cowan, 1010 Bassett Tower, El Paso, Tex.
Main Line Supt., C. O. Byrne, 1010 Bassett Tower, El Paso, Tex.
Pur. Agt., W. R. Hall, 1010 Bassett Tower, El Paso, Tex.

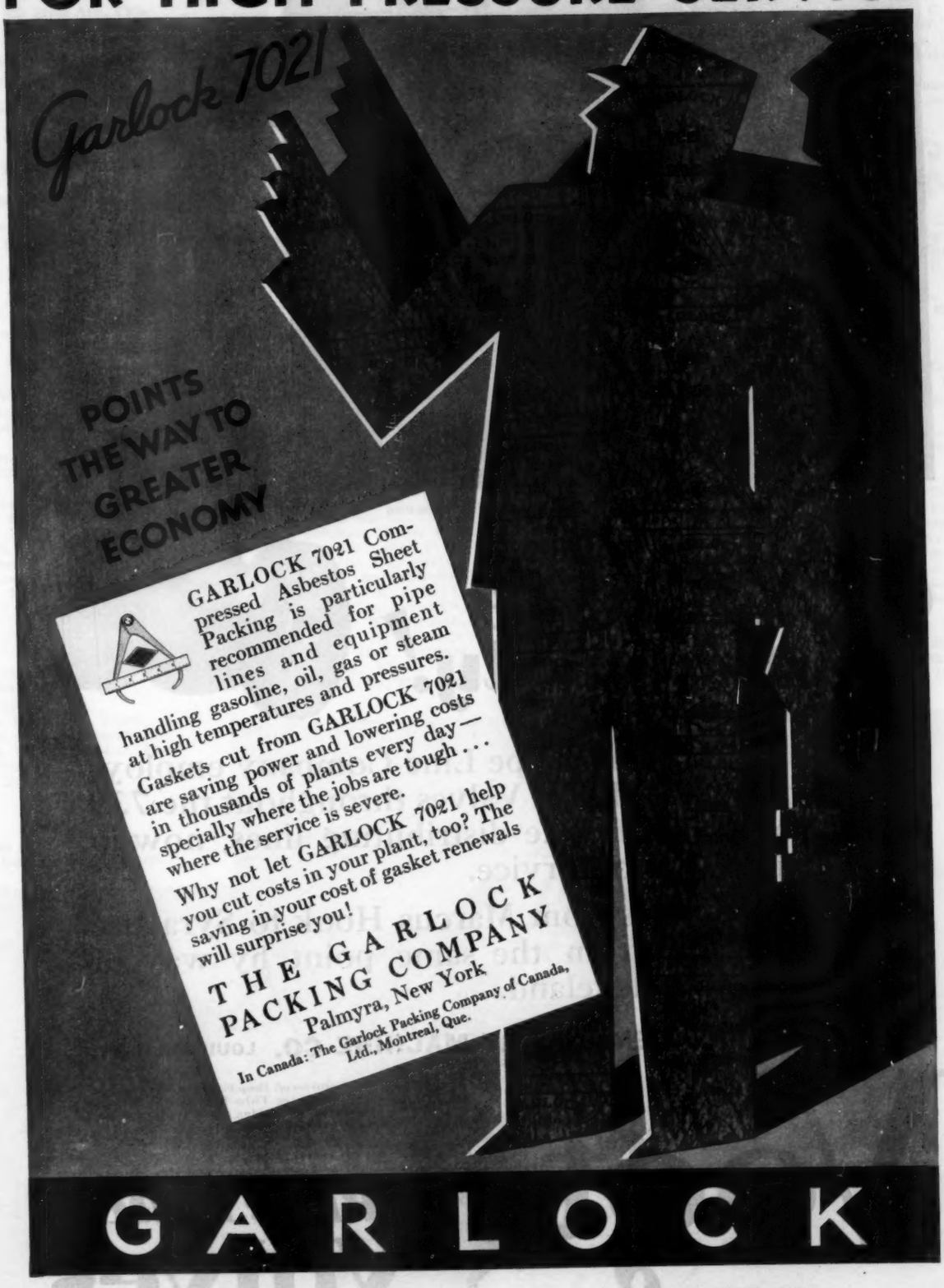
Empire Southern Gas Co. and Empire Southern Service Co.

Gen. Mgr., F. H. Coughlin, 402 T. & P. Bldg. Fort Worth, Tex.
Mgrs., J. P. Kenney, Empire Southern Gas Co., Brady, Tex.; J. A. Davis, Empire Southern Gas Co., Big



Map of Atlantic Pipe Line Co.'s system

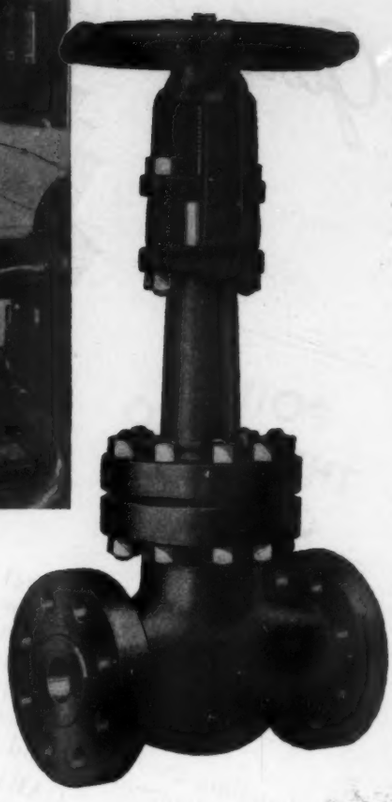
FOR HIGH PRESSURE SERVICE


Garlock 7021
POINTS THE WAY TO GREATER ECONOMY
GARLOCK 7021 Compressed Asbestos Sheet Packing is particularly recommended for pipe lines and equipment handling gasoline, oil, gas or steam at high temperatures and pressures. Gaskets cut from GARLOCK 7021 are saving power and lowering costs in thousands of plants every day—specially where the jobs are tough... where the service is severe.
Why not let GARLOCK 7021 help you cut costs in your plant, too? The saving in your cost of gasket renewals will surprise you!
THE GARLOCK PACKING COMPANY
Palmyra, New York
In Canada: The Garlock Packing Company of Canada, Ltd., Montreal, Que.

GARLOCK

TULSA, OKLA. LOS ANGELES, CAL.

Interior of one of nine pumping stations of the Susquehanna Pipe Line Company.



Endurance and Safety!

The Susquehanna Pipe Line Company employs Vogt drop forged steel Valves throughout the 730 miles of their gasoline distributing lines, now in the fourth year of service.

One line extends from Marcus Hook to Syracuse and the other from the same point by way of Pittsburgh to Cleveland.

HENRY VOGT MACHINE CO. LOUISVILLE, KY.
INCORPORATED

NEW YORK
CHICAGO
CLEVELAND
DALLAS
PHILADELPHIA

Manufacturers of: Drop Forged Steel Valves and Fittings, Water Tube Boilers, Oil Refinery Equipment, Ice Making and Refrigerating Machinery, Heat Exchangers.

Vogt

Pipe Line Valves

Spring, Tex.; J. A. Davis, Empire Southern Service Co., Big Spring, Tex.; Ernst Tetens, Empire Southern Gas Co., Gorman, Tex.; Jasper Goodwill, Empire Southern Gas Co., Minden, La.; R. W. Adams, Empire Southern Gas Co., Clarksville, Ark.
Miles of pipe lines owned and operated, 260.47.

Equitable Gas Co., 435 Sixth Ave., Pittsburgh, Pa.

Pres., Frank R. Phillips.
V. P. and Gen. Mgr., F. F. Schauer.
Asst. to V. P. and Gen. Mgr., E. D. Leland.
V. P. Charge of Sales, Joseph McKinley.
Gen. Pur. Agt., C. W. Lepper.
Oper. Mgr., D. P. Hartson.
Gen. Supt. Distribution, T. H. Kendall.
Supt. Div. "AB," E. E. Keeler, Seventeenth and Wharton Sts., S.S., Pittsburgh, Pa.
Supt. Div. "C," G. W. Stuart, 6304 Penn Ave., E.E., Pittsburgh, Pa.
Supt. Div. "E," G. W. Brown, 139 Atlantic Ave., McKeesport, Pa.
Supt. of Prod. and Geologist, J. H. Newlon.
Supt. Div. "G," J. F. Ashenhart, 811 Mill St., Tarentum, Pa.
Supt. Div. "H," J. M. Headley, Equitable Gas Co., Waynesboro, Pa.
Asst. Geologist, J. V. Goodman.
Asst. to Oper. Mgr., F. N. Wolf.
Distribution Egr., C. H. Whitwell.
Supervisor Maps and Surveys, C. A. Mechesney.
Supt., Gas Meas., D. B. Beecher.
Supervisor, System Oper., G. H. Neilson, Jr.
Supt. Comp. Stas., Judson Bonsall, 604 Union Bank Bldg., Clarksburg, W. Va.
Asst. Land Agt., H. H. Pigott.
Supt. of Telephones, V. H. Dake.
Miles of pipe lines owned and operated, transmission 1,040; distribution 1,466.

F

Federal Gas & Fuel Co., 99 N. Front St., Columbus, Ohio.

Pres., C. I. Weaver.
V. P. and Gen. Mgr., E. M. Tharp.
V. P.s, T. H. Kerr, T. B. Gregory, 800 Union Trust Bldg., Pittsburgh, Pa., and H. H. Hall.
Treas., E. D. Bivens.
Sec., P. A. Alberty.
Asst. Sec. and Asst. Treas., P. A. Balliet.
Asst. Treas., N. E. Shupe, E. C. Sharpe and J. E. Parsons.

Fort Smith Gas Co. and Southwestern States Gas Co., 711 Garrison Ave., Fort Smith, Ark.

Mgr., A. B. Harper.
Supts. of Distribution, S. R. Walker and H. H. Griffin.
Fort Smith Gas Co., 200 miles of mains; Southwestern States Gas Co., 25 miles of mains.

Frankfort-Kentucky Natural Gas Co., Inc., Frankfort, Ky.

Gen. Mgr., T. J. Tonkin, Jr., Lexington, Ky.
Local Mgr., Jos. J. Kernen.

G

Gas Service Co., 601 Dwight Bldg., Kansas City, Mo.

V. P. and Gen. Mgr., B. C. Adams.
Pur. Agt., J. L. Parker.
Sec., Harry Warner.
Supt., C. H. Koinm.
Mgrs., J. G. Mawson, Arkansas Valley Gas Co., Arkansas City, Kans.; A. F. Potter, Bartlesville Gas & Electric Co., Bartlesville, Okla.; G. J. Swan, Capital Gas & Electric Co., Topeka, Kans.; R. D. Ford, Carthage Gas Co., Carthage, Mo.; R. E. Holland, Consumers Gas Co., Miami, Okla.; A. M. Grall, Hutchinson Gas Co., Hutchinson, Kans.; L. L. Garner, Jackson County Light, Heat & Power Co., Independence, Kans.; E. C. Pfenning, Joplin Gas Co., Joplin, Mo.; T. J. Strickler, Kansas City Gas Co., Kansas City, Mo.; E. A. Wilder, Newton Gas Co., Newton, Kans.; L. M. King, Ozark Distributing Co., Carrollton, Mo.; H. L. Siebenthaler, Ozark Distributing Co., Monett, Mo.; H. W. Johnston, Ozark Distributing Co., Warrensburg, Mo.; L. H. Albus, Pittsburg Gas Co., Pittsburg, Kans.; Fred Karr, St. Joseph Gas Co., St. Joseph, Mo.; H. S. Hicks, Union Public Service Co., Ottawa, Kans.; N. W. Carpenter, Union Public Service Co., Chelsea, Okla.; R. C. Dellinger, Union Public Service Co., Cherryvale, Kans.; R. C. Brosius, Union Public Service Co., Fort Scott, Kans.; J. B. Powell, Union Public Service Co., Hiawatha, Kans.; S. O. Vaughn, Union Public Service Co., Merriam, Kans.; T. B. Wood, Union Public Service Co., Nowata, Okla.; Fred Tawney, Union Public Service Co., Osawatomie, Kans.; Wess Adams, Union Public Service Co., Beloit, Kans.; Herbert Stockwell, Union Public Service Co., Paola, Kans.; Ralph Weir, Union Public Service Co., Parsons, Kans.; Charles O'Neill, Webb City & Carterville Gas Co., Webb City, Mo.; E. S. Miller, Western Distributing Co., Eldorado, Kans.; W. R. Phipps, Wichita Gas Co., Wichita, Kans.; W. H. McKenzie, Wyandotte County Gas Co., Kansas City, Kans.

H

Hamilton Gas Co., 155 E. Forty-fourth St., New York, N. Y.

Pres., W. Angamar Larner.
V. P., P. V. R. Van Wyck.
Sec. and Treas., Charles Chandler.
Miles of pipe line owned and operated, approximately 152 miles of pipe and gathering lines.

Harrisburg Gas Co., 14 S. Market Square, Harrisburg, Pa.

Pres., N. B. Bertolette.
V. P.s, George R. Bailey, and F. J. Rutledge, 1401 Arch St., Philadelphia, Pa.
Sec., Johns Hopkins, 1401 Arch St., Philadelphia, Pa.
Treas., I. W. Morris, 1401 Arch St., Philadelphia, Pa.
Pur. Agt., R. Z. Zimmerman, 1401 Arch St., Philadelphia, Pa.
Mgr., Oper. Dept., George B. Bains.
Mgr., Sales Dept., George L. Cullen.
Office Mgr., William H. German.
Asst. Mgr., Oper. Dept., R. L. James.
Pres., George A. Hill, Jr.
Gen. Mgr., F. W. Kirk.
Act. Gen. Mgr., C. Lee Wood.
Ch. Egr., F. Y. Hutchison.
Pur. Agt., Oscar Cummings.
Ch. Dispatcher, H. D. Carmouche.

Hope Natural Gas Co., 545 William Penn Way, Pittsburgh, Pa.

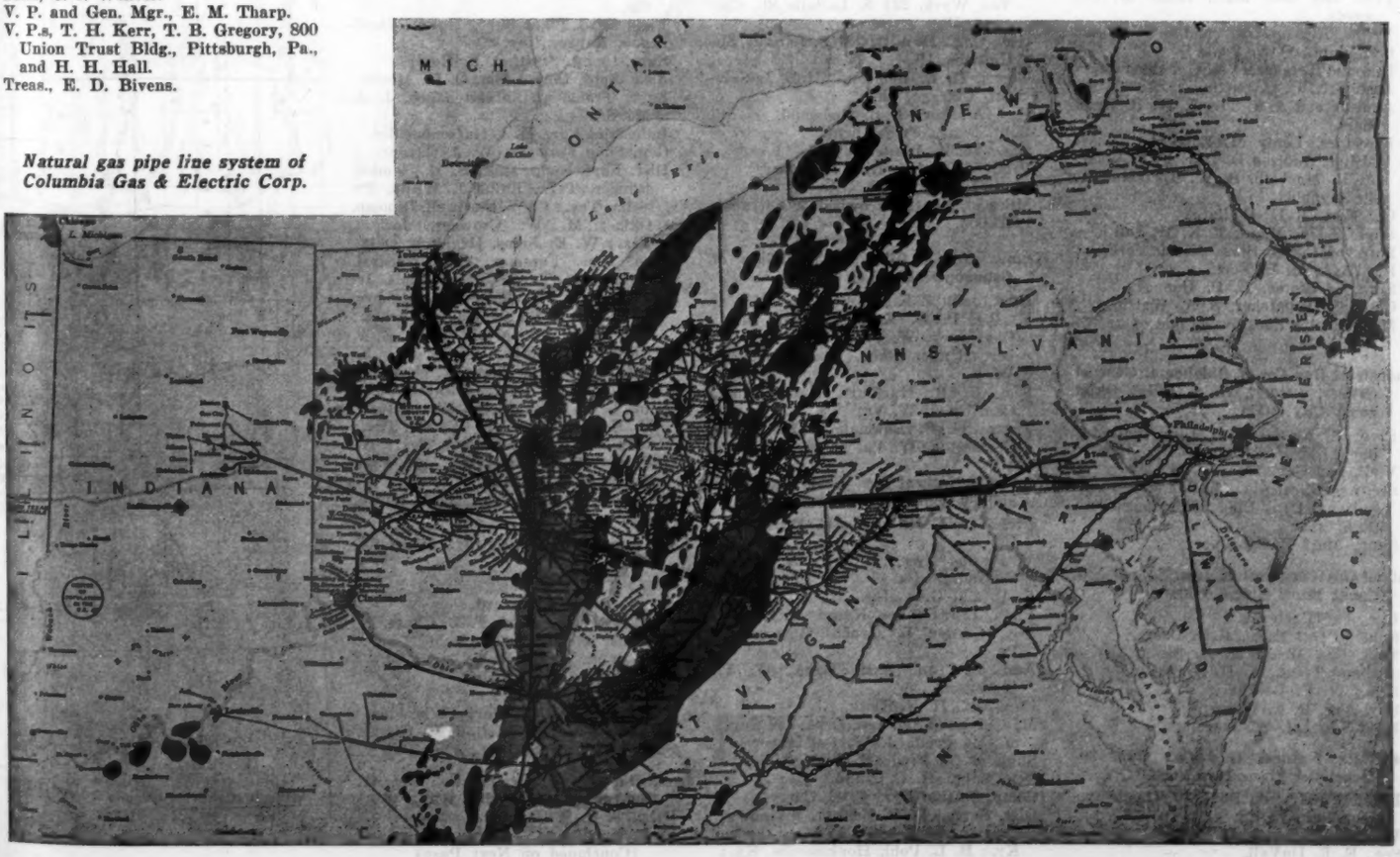
V. P. and Gen. Mgr., Howell C. Cooper.
V. P. and Ch. Egr., Loring L. Tonkin.
Gen. Supt., W. B. Gribble. 445 Main St., Clarksburg, W. Va.
Asst. Gen. Supt., C. C. Reed, 445 Main St., Clarksburg, W. Va.
Supt. of Pipe Lines, L. G. Kincheloe, 445 Main St., Clarksburg, W. Va.
Supt. of Meters, J. G. Mallory, 445 Main St., Clarksburg, W. Va.
Miles of pipe lines owned or operated, 4,680.

Hope Natural Gas Co., 445 West Main St., Clarksburg, W. Va.

Pres. and Gen. Mgr., H. C. Cooper, 545 William Penn Way, Pittsburgh, Pa.
V. P. and Ch. Egr., L. L. Tonkin, 545 William Penn Way, Pittsburgh, Pa.
Gen. Supt., W. B. Gribble.
Asst. Gen. Supts., C. C. Reed and J. A. Clark.
Main Line Supt., L. G. Kincheloe.
Supt. Meters, J. G. Mallory.
Foreman, Alva R. Kuhn, Glouster, Ohio.

Houston Pipe Line Co., Twelfth Floor, Petroleum Bldg., Houston, Tex.

Supt. Meas., C. J. Brown.
Supt. of Power, W. E. Smith, care of Houston Pipe Line Co., Dinero, Tex.
Supt. of Fields, Rex West, Box 991, Beeville, Tex.
Dist. Foremen, P. J. Manning, Box 790, Bay City, Tex.; E. E. Trapp, care of Houston Pipe Line Co., Freeport, Tex.; Floyd Curtsinger, Box 464, Victoria, Tex.; T. A. Chappell, care of Houston Pipe Line Co., Wharton, Tex.; J. W. Mayo, care of Houston Pipe Line Co., Houston, Tex.; Charles Anderson, Box 505, Edna, Tex.
Field Foremen, H. J. Worth, care of Houston Pipe Line Co., Woodsboro, Tex.; H. C. Shaw, Box 268, Hebbronville, Tex.; R. W. Harvey, care



Natural gas pipe line system of Columbia Gas & Electric Corp.

of Houston Pipe Line Co., Dinero, Tex.; J. W. Adams, care of Houston Pipe Line Co., Taft, Tex.
Gen. Inspector, J. W. Fincher, Petroleum Bldg., Houston, Tex.
Egrs., Julian Petrich, Box 505, Edna, Tex.; Clarence Robbins, care of Houston Pipe Line Co., Dinero, Tex.; W. H. Coster, care of Houston Pipe Line Co., Woodsboro, Tex.; G. P. Parker, Box 268, Hebbronville, Tex.
Warehouseman, J. A. Holloway, Box 505, Edna, Tex.; O. A. Rosenthal, care of Houston Pipe Line Co., Houston, Tex.; Jack LaBauve, care of Houston Pipe Line Co., Dinero, Tex.; Aaron Dobbs, care of Houston Pipe Line Co., Woodsboro, Tex.; H. L. Hilbun, Box 268, Hebbronville, Tex.
Tel. Foreman, J. F. Collerain, Petroleum Bldg., Houston, Tex.

I

Independent Natural Gas Co., Bartlesville, Okla.
Pres., Frank Phillips.
V. P.s, John H. Kane, F. E. Rice, C. J. Minnig.
Sec. and Treas., O. K. Wing.
Asst. Sec. and Treas., B. F. Stradley.
Supt. of Seminole Dist., R. J. Slingluff, Holdenville, Okla.
Supt., Texas Panhandle Dist., Rex McRoy, Breckenridge, Tex.
Owns and operates 370 miles of lines.

Indiana Southwestern Gas Corp., LaPlante Bldg., Vincennes, Ind.
Pres., Frank E. Kistler, Littleton, Colo.
V. P. and Gen. Mgr., H. A. Sprowls.
Sec. and Treas., A. C. Toupal.
Supt., K. C. Bell.
Pur. Agt., H. F. Klopp.
Egr., R. E. Eckel.
Asst. Supt., Clyde Montgomery, Francisco, Ind.
Meter Dept., G. H. Plank, Petersburg, Ind.

Industrial Fuel Supply Co., 1016 Los Angeles Gas & Electric Corp. Bldg., Los Angeles, Calif.
Pres. and Gen. Mgr., Leroy M. Edwards.
V. P.s, R. W. Miller and S. W. Todd.
Gen. Supt., C. S. Pool.
Sec. and Treasurer, A. C. Johnston.
Asst. Sec., O. C. Sattinger.
Auditor and Asst. Treas., W. R. Dammers.
Directors, Leroy M. Edwards, R. W. Miller, Addison B. Day, F. S. Wade, A. B. Macbeth, S. W. Todd and T. J. Reynolds.
Ch. Egr., J. E. Wallace.
Supt. of Gas Meas., T. K. M. Smith.
Supt. of Comp. Stas., E. L. Ford.
Pur. Agt., M. L. Fort.
Supt. of Stores, L. P. Bonnat.
Ch. Gas Dispatcher, S. A. Walsh.
Miles of pipe lines owned ond operated. 155.95.

Industrial Gas Co. of Oklahoma, General Offices, 1216-17 Hales Bldg., Oklahoma City, Okla.
Pres., R. K. Johnston, First National Bank Bldg., Oklahoma City, Okla.
V. P. and Gen. Mgr., F. H. Mugg.
Sec. and Treas., A. H. Bahnker, First National Bank Bldg., Oklahoma City, Okla.
Supt., Matt Bumgardner.

Inland Gas Corporation, Inc., Second National Bank Bldg., Ashland, Ky.
Egr., O. H. Horne.
Supt. of Gas Sales, J. H. Baxter.
Supt. Gas Meas., H. R. Stump.
Sec. and Treas., A. H. Grayburn.
Pres., W. E. Lockhart.
Pur. Agt., R. F. Wright.
Field Supt., J. W. Lockhart.

Interstate Natural Gas Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
Pres., William von Phul, 39 Broadway, New York, N. Y.
V. P., F. H. Lerch, Jr.
Sec., E. E. DuVall.
Treas., James Comerford.
Asst. Treas., A. H. Salisbury, 405 Ouachita National Bank Bldg., Monroe, La.
Gen. Supt. and Pur. Agt., John Gordon, 405 Ouachita National Bank Bldg., Monroe, La.
Supt. Comp. Stas., S. J. Struben, 405 Ouachita National Bank Bldg., Monroe, La.
Supt. Land Dept., Fred A. Green, 405 Ouachita National Bank Bldg., Monroe, La.

K

Kansas-Osage Gas Co., Ponca City, Okla.
Pres., D. J. Moran.
V. P., E. J. Nicklos
Pur. Agt., W. H. O'Connor.
Ch. Egr., E. O. Bennett.
Supt., D. C. Williams.
Asst. Supt., Al Janke.
Ch. Clerk, J. E. Shobe.
Miles of pipe lines owned or operated, 168.

Kansas Pipe Line & Gas Co., Salina, Kans.
Pres., D. E. Ackers, 808 Kansas Ave., Topeka, Kans.
V. P.s, C. E. Brock; W. D. Gale, 231 S. LaSalle St., Chicago, Ill. and Allen Van Wyck, 231 S. LaSalle St., Chicago, Ill.
Sec., C. F. DeWitt, 231 S. LaSalle St., Chicago, Ill.
Treas., H. E. Johnson, 231 S. LaSalle St., Chicago, Ill.
Gen. Auditor, S. B. Redmond.
Supt. Distr., F. P. Dicus.
Egr., W. J. White.
Pres. Dispatcher, R. W. Howard.
Miles of pipe lines owned and operated, 126.877, leased and operated 458.428.

Kansas Power & Light Co. (Natural Gas Division), Salina, Kans.
Pres., D. E. Ackers, 808 Kansas Ave., Topeka, Kans.
V. P.s, C. E. Brock; W. D. Gale, 231 S. LaSalle St., Chicago, Ill.; H. L. Hanley, 231 S. LaSalle St., Chicago, Ill.; J. D. Mortimer, 231 S. LaSalle St., Chicago, Ill., and Allen Van Wyck, 231 S. LaSalle St., Chicago, Ill.
Sec., C. F. DeWitt, 231 S. LaSalle St., Chicago, Ill.
Treas., H. E. Johnson, 231 S. LaSalle St., Chicago, Ill.
Gen. Auditor, S. B. Redmond.
Supt. Distr., F. P. Dicus.
Egr., W. J. White.
Pres. Dispatcher, R. W. Howard.
Supt. Plants, H. R. Otto.
Miles of pipe lines owned or operated, 1,001.053.

Kenova Gas & Oil Co. (Subsidiary of Commonwealth Gas Corp.).
Pres., John J. Klise, Wooster, Ohio.
V. P.s, P. D. Koontz, Union Bldg., Charleston, W. Va.; Harry B. Lambert, Union Bldg., Charleston, W. Va.
Sec., F. R. Hurlburt, Union Bldg., Charleston, W. Va.
Treas., C. F. Bauman, Union Bldg., Charleston, W. Va.

Kentucky Natural Gas Corp. and Subsidiary Companies, Owensboro, Ky.
Pres., J. H. Hillman, Jr., Pittsburgh, Pa.
V. P. and Treas., Charles A. Meyer, Pittsburgh, Pa.
V. P. and Gen. Mgr., W. J. Hinchey.
V. P., J. J. Connor, Kansas City, Mo.
Sec., Gordon L. Grubbs, Pittsburgh, Pa.
Asst. Sec. and Asst. Treas., W. T. Stevenson.
Pur. Agt., H. F. Keith.
Mgr. of Land and Lse. Dept. and Supt. of Gas Prod., J. W. Polkinghorn.
Supt. of Oil Prod., H. C. McKinley.
Gen. Supt., H. C. Nunn.
Comp. Station Egr., C. E. Curry.
Dist. Supts., L. B. Benson, Vincennes, Ind.; A. L. Roberts, Bowling Green, Ky.; B. L. Pohl, Hopkinsville, Ky.; W. J. Theis, Henderson, Ky., and R. L. Robards.
Supt. of Distr., H. H. Walker.
New Business Mgr., J. L. Bugg.

Kentucky-Ohio Gas Co.
Pres., Bradford M. Couch, 1515 Locust St., Philadelphia, Pa.
V. P. and Asst. Sec., Carl F. R. Hassold, 1508 Walnut St., Philadelphia, Pa.
V. P. and Treas., John Robertson, 213 Fidelity Bldg., Baltimore, Md.
Sec., Walter Logan, 17 John St., Room 1,001, New York, N. Y.
Gen. Mgr. and Supt., H. H. Miller, 2701 Adams St., Ashland, Ky.

L

LeFlore County Gas & Electric Co., Poteau, Okla.
Pres., Charles T. Orr, Joplin, Mo.
V. P. and Gen. Mgr., Raymond F. Orr, Fort Smith, Ark.
Field Supt., H. A. Sickmann.
Comp. Sta. Supt., George F. Allen.
Miles of main line pipe owned and operated, 55.

Little Rock Gas & Fuel Co., Little Rock, Ark.
Gen. Mgr., R. W. Curran.

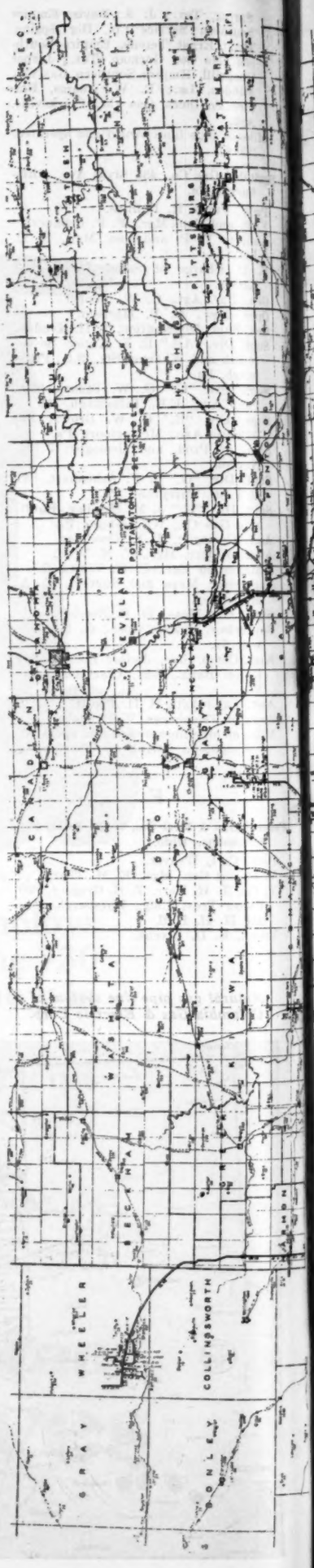
Lloydminster Gas Co., Ltd., Lloydminster, Saskatchewan, Canada.
Pres., H. Rumble.
V. P., F. H. Dunstan.
Sec. and Treas., J. W. Brockhurst.
Egr., A. I. Payne, Edmonton, Alberta.

Lone Star Gas Co., 1915 Wood St., Dallas, Tex.
Pres., L. B. Denning.
V. P.s, R. A. Crawford and Karl F. Griffith.
V. P. and Gen. Mgr., F. L. Chase.
Sec. and Treas., D. L. Cobb.
Asst. Sec. and Asst. Treas., H. G. Cornatzer.
Asst. Sec., T. J. Uhl.
Gen. Supt., Elmer F. Schmidt.
Ch. Egr., Julian L. Foster.
Supt. of Gas Meas., D. A. Sillers.
Supt. Pipe Lines, R. Vandercook.
Asst. Supt. Pipe Lines, Luther Tolbert.
Supt. Gaso. Plants, J. R. Jarvis.
Asst. Supt. Gaso. Plants, Paul C. Coffin.
Field Gaso. Plant Supt., Harry Wheeldon, Ranger, Tex.
Supt. Comp. Stas., B. L. Rogers.
Asst. Supt. Comp. Sta., O. H. Moore.
Supt. Trans. and Maintenance, J. A. Martin.
Industrial Egr., E. J. Hatzenbuehler.
Gen. Shop Foreman, W. J. Garner.
Dist. Egrs. comp. stas., S. M. Gamble, Ranger, Tex.; Ralph L. Shipp, Petrolia, Tex.; C. W. Cardwell, Duncan, Okla.; M. W. Crowder, Joshua, Tex.; W. E. Johns, Healdton, Okla.
Pipe Line Foremen, Tod Pazdral, Gainesville, Tex.; C. S. Nichols, Irving, Tex.; E. K. Smith, Ranger, Tex.; Mark Black, Duncan, Okla.; Fay Smith, Shamrock, Tex.; J. T. Bickley, Coleman, Tex.; W. K. Weaver, Vernon, Tex.; W. G. Webb, Gordon, Tex.; George Minton, Joshua, Tex.; Eldon Glenn, Waco, Tex.; T. E. Waddill, Fort Worth, Tex.; John I. Pearce, Richland, Tex.; W. F. Crook, Abilene, Tex., and Fred Smith, Petrolia, Tex.
Telephone Supt., Grover Reed, Bowie, Tex.

Lone Star Gasoline Co., 1915 Wood St., Dallas, Tex.
Pres., L. B. Denning.
V. P., R. A. Crawford.
V. P. and Gen. Mgr., F. L. Chase.
Sec. and Treas., D. L. Cobb.
Gen. Supt., J. R. Jarvis.
Asst. Supt., Paul Coffin.
Sales Mgr., A. F. Garrett.
Supt. Ranger Dist., Harry Wheeldon.
Asst. Supt. Ranger Dist., J. M. Kindle.
Supt. Breckenridge Dist., J. A. Bates.

Louisville Gas & Electric Co., 311 W. Chestnut St., Louisville, Ky.
Pres., T. B. Wilson.
V. P. and Treas., J. J. McKenna.

(Continued on Next Page)



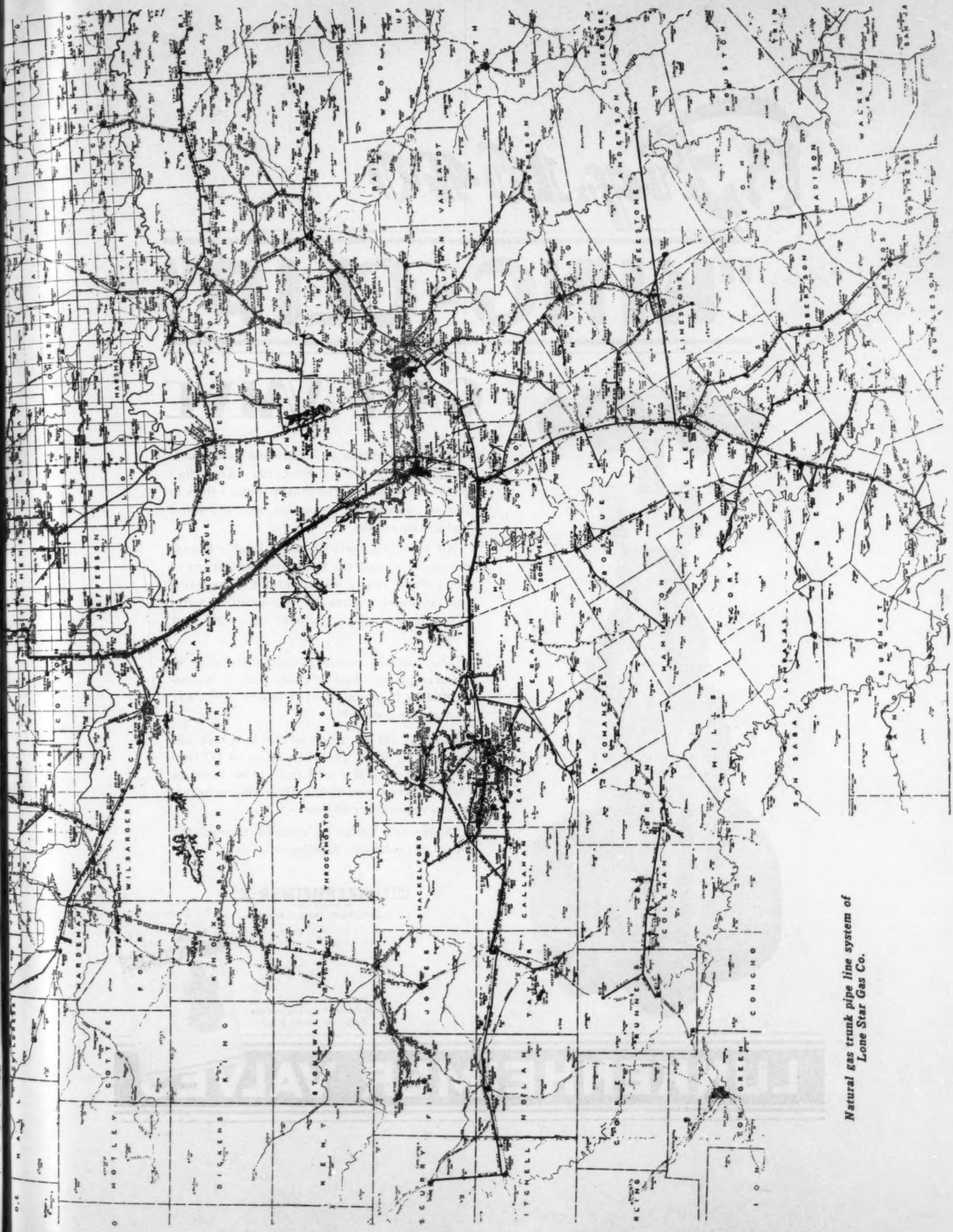

VAN ZANDT
SMITH
WOOD
RAINS
WOOD
WOOD
WOOD

Fig. 1640

"KING-CLIP"

GATE VALVE

Because it stands up where the treatment is rough and the service hard, the "King-clip" has become one of the most popular valves in the oil country for steam, oil, gas, air, water and gasoline lines.

All working parts are of a durable bronze composition, and the body and bonnet are of iron suitably coated inside and out to resist rust and corrosion. Thus the "King-clip" is virtually a bronze valve enclosed in a rigid iron casing.

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Minnesota Northern Power Co. Holding Company for Montana Petroleum Co.

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Minnesota Northern Power Co. Holding Company for Gas Development Co.

Div. Mgr., H. A. Schroth, Baker, Mont.

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Supt. of Comp. Stas., K. H. Bane.
Supt. of Distr., Fairmont Dist., J. R. Henderson.
Supt. of Distr., Morgantown Dist., J. W. Allison, Morgantown, W. Va.
Geologist, H. C. Ice.
Miles of pipe lines owned or operated, 463.05.

Mountain Fuel Supply Co., General Office, 539 S. Main St., Findlay, Ohio; Operating Office, Rock Springs, Wyo.

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V. P.s, C. R. Hetzler, Rock Springs, Wyo.; C. L. Fleming, Findlay, Ohio.
Sec. and Asst. Treas., E. B. Redpath, Findlay, Ohio.
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Asst. Sec. and Asst. Treas., L. M. Kipschlag, Casper, Wyo.
linger, Casper, Wyo.; N. L. Batten-
Asst. Secs., A. Baker, Casper, Wyo.; L. C. Peschel, Findlay, Ohio.
Pipe lines owned, 111.25 miles.

N

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Miles of pipe lines owned or operated, 242.380.

New York State Natural Gas Corp., Keuka Construction Corp.

Pres., John B. Tonkin, 545 William Penn Way, Pittsburgh, Pa.
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Miles of pipe lines owned or operated, 2,079.03.

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Miles of pipe lines owned or operated, 1,219.

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Northwestern Utilities, Ltd., 10124 One-Hundred and Fourth St., Edmonton, Alberta.
Pres. and Managing Dir., H. R. Milner, K.C., Northwestern Utilities, Ltd., Edmonton, Alberta.
V. P., E. W. Bowness, Canadian Western Natural Gas, Light, Heat & Power Co., Ltd, 215 Sixth Ave., W. Calgary, Alberta.
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Gen. Supt., C. H. Spencer, Northwestern Utilities, Ltd., Edmonton, Alberta.
Ch. Egr., E. Nelson, Northwestern Utilities, Ltd., Edmonton, Alberta.
Pur. Agt., H. W. Francis, Canadian Utilities, Ltd., 215 Sixth Ave. W., Calgary, Alberta.
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House Heating Egr., E. W. Bell, Northwestern Utilities, Ltd., Edmonton, Alberta.
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Miles of pipe lines owned or operated, 283.6.

O

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V. P. and Gen. Mgr., E. M. Tharp.
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Ch. Egrs., W. V. Wonderly, Ohio Fuel Gas Co., Sugar Grove, Ohio; L. D. Meyers, Ohio Fuel Gas Co., Homer, Ohio.
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Field Supts., W. M. Blum, Kirn Bldg., Lancaster, Ohio; A. E. Boyd, 81 Steubenville Ave, Cambridge, Ohio; Ralph Frary, Kirn Bldg., Lancaster, Ohio; H. C. Simmons, 508 W. Gambier St., Mount Vernon, Ohio; D. B. Walker, N. Market St., Wooster, Ohio; W. C. Gunderfinger, 11½

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Supt. of Prod., E. C. Overbeck.
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Oklahoma Natural Gas Co., P. O. Box 871, Tulsa, Okla.

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V. P., W. Jennings Young.
Sec. and Treas., John Mitchell.
Asst. Treas., Fred W. Peters.
Asst. Sec., Ruth Canaday.
Asst. to Pres., V. K. Sparks.
Supt. Trans and Dist., L. A. Farmer.
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Supt. Gas Meas., Gilbert Estill.
Per. Dir., R. S. Huffman.
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Dist. Supt., W. A. Hazard; W. G. Van Arsdale, Box 1617, Muskogee, Okla.; E. H. Newkirk, Box 2231, Okmulgee, Okla.; Lee Prokop, Box 3091, Shawnee, Okla.; T. A. Wood, Box 987, Oklahoma City, Okla.; Glen Rambo, Box 987, Oklahoma City, Okla.; C. R. Shiers, Box 898, Enid, Okla.; Jack Gillis, Box 969, Ardmore, Okla.
Miles of pipe lines owned or operated, 3,258.58.

Oklahoma Power & Water Co., Sand Springs, Okla.

Pres., W. B. Head, Jr.
Gen. Supt., T. E. Mansfield.
Gas Supt., H. H. Young.
Supt. in Charge of Services, C. W. Carlson.
Gas Foremen, L. O. Wilson; W. R. Harrell, Osage, Okla.
Com. Mgr., G. S. Adamson.
Sec. and Treas., G. W. Evans.
Miles of pipe lines owned or operated, 165.5.

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V. P. and Treas., C. H. Caldwell.
V. P. and Counsel, R. L. Gordon.
Sec., E. B. Emenhiser.
Supt., F. F. Finney.
Local Mgr., J. G. Allen, Barnsdall, Okla.

Osage Producers Gas Co., Bartlesville, Okla.

Pres., H. V. Foster, 85 Beach St., Westerly, R. I.
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P

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V. P., George Belchic.
Sec. and Treas., R. M. Craigmyle, 1 Wall St., New York, N. Y.
Asst. Sec. and Asst. Treas., F. J. Gaumer.
Land & Legal Dept., D. C. Laskey.
Egr., M. C. Bubenzer.
Mgr., R. H. Curry, Drawer R, Haynesville, La.

Panhandle Eastern Pipe Line Co. and Subsidiary Companies, Fairfax Bldg., Kansas City, Mo.

Pres. and Gen. Mgr., B. R. Bay.
V. P., J. F. Curry.
Asst. Treas., Leith V. Watkins and N. F. Paxton.
Ch. Egr., O. L. Carson.
Supt. of Prod., J. D. Freeman.
Counsel, G. J. Neuner.
Supt. of Land Dept., H. W. Pope.
Supt. of Trans., J. C. Reinbold.
Pur. Agt., S. A. Taylor.
Supt. of Gas Meas., F. C. Walters.

Panhandle Eastern Pipe Line Co.

Div. Supts., D. K. Stephens, Boonville, Mo.; J. C. Wright, Paola, Kans.; J. L. Murphy, Liberal, Kans.
Comp. Sta. Supts., R. W. Plank, Liberal, Kans.; S. J. Dunlap, Louisburg, Kans.

Panhandle Illinois Pipe Line Co.

Div. Supt., W. K. Sanders, Glenarm, Ill.
Comp. Sta. Supt., W. E. Frederick, Glenarm, Ill.

Texas-Interstate Pipe Line Co.

Prod. Supt., E. P. Lee, Sneed Camp, Stinnett, Tex.

Pennsylvania Power & Light Co., Allentown, Pa.

Pres., J. S. Wise, Jr.
Sec. and Treas., C. M. Walter.
Gen. Mgr., N. G. Reinicker.
Miles of natural gas distribution pipe lines owned, 253.6.

Peoples Ice & Fuel Co. (Successor to Kansas Gas & Gasoline Co.), Salina, Kans.

Pres., D. E. Ackers, 808 Kansas Ave., Topeka, Kans.
V. P.s, C. E. Brock; W. D. Gale, 231 S. LaSalle St., Chicago, Ill.; Allen Van Wyck, 231 S. LaSalle St., Chicago, Ill.
Sec., C. F. DeWitt, 231 S. LaSalle St., Chicago, Ill.
Treas., H. E. Johnson, 231 S. LaSalle St., Chicago, Ill.
Gen. Auditor, S. B. Redmond.
Supt. Plants, H. R. Otto.
Egr., W. J. White.

Peoples Natural Gas Co., 545 William Penn Way, Pittsburgh, Pa.

Pres., J. B. Tonkin.
V. P. and Mgr., E. W. Williamson.
Geologist and Egr., J. French Robinson, Wellsboro, Pa.
Egrs., S. C. Preston and A. C. Perry.
Dist. Foremen, M. R. McKinley, Drawer No. 912, Monongahela, Pa.; Charles D. Altman, R.F.D. No. 1, Wayport, Pa.; W. S. King, Murrysville, Pa.; C. R. Spencer, R.F.D. No. 6, Box 76, Kittanning, Pa.; W. D. Griffith, Waynesburg, Pa.; Geo. Fonner, Box 115, Glenshaw, Pa.
Pipe Line Foreman, G. H. Feeney, East McKeesport, Pa.
Town Foremen, D. Q. Johnson, 114 Church St., Turtle Creek, Pa.; J. M. Hilty, 1624 Eleventh Ave., Altoona, Pa.
Map Dept., Clyde Weitzel.

Phillips, T. W., Gas & Oil Co., Butler, Pa.

Pres., T. W. Phillips, Jr.
V. P., B. D. Phillips.
Sec., H. H. Phillips.

Pioneer Pipe Lines, Inc. (Owned by Union Gas System, Inc.), Independence, Kans.

Pres., Paul R. Johnson.
V. P., Vernon F. Palmer.
Treas., Harry F. Mitchell.
Sec. and Attr., Donald W. Stewart.
Gen. Supt. Trans. and Const., Livingston J. Love.
Pur. Agt., William L. Orr.

Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Chm. Bd., Clarence M. Brown, Land Title Bldg., Philadelphia, Pa.
Pres., H. S. Wherrett.
V. P., R. L. Clause.
Sec., C. S. Lamb.
Treas., F. W. Currier.
Pur. Agt., J. A. Bechtel.
Supt. Gas Wells and Lines, J. A. W. Miller, Ford City, Pa.
Foreman Wells and Lines, W. K. Millen, Ford City, Pa.
Asst. Foreman Wells, L. C. Bittinger, Ford Cliff, Pa.
Asst. Foreman Lines, B. A. Henry, McGrann, Pa.

Pittsburgh & West Virginia Gas Co., 435 Sixth Ave., Pittsburgh, Pa.

Pres., Frank R. Phillips.
V. P. and Gen. Mgr., F. F. Schauer.
Asst. to V. P., E. D. Leland.
V. P. in Chg. of Sales, Joseph McKinley.
Gen. Pur. Agt., C. W. Lepper.
Oper. Mgr., D. P. Hartson.
Supt. of Prod. and Geologist, J. H. Newlon.
Supt. Div. F, L. A. Lemasters, Union Bank Bldg., Clarksburg, W. Va.

TITE-LINE

FOR— OIL GAS GASOLINE WATER AIR— LINES

FOR PRESSURE OR VACUUM ..... PULSATING OR VIBRATING LINES

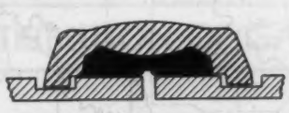
COUPLINGS

2500 POUNDS TEST PRESSURE
FORGED STEEL HOUSINGS
COMPRESSION RUBBER PACKED
FLEXIBLE
CONSTANT SEALING POWER

A two bolt compression pack coupling. Invaluable for quick assembling leak-proof hook-ups—Gathering Lines—Tank Batteries—Pumps—Manifolds—many other places. For buried or above ground lines.

Available now in 2", 3", 4" & 8" SIZES— Other sizes immediately.

A PERFECT COMPRESSION PACK



WRITE FOR PAMPHLET

NATIONAL TANK CO.
TULSA, OKLA.

Supt. Div. I, G. T. Bradley, Pittsburgh & West Virginia Gas Co., Littleton, W. Va.

Supt. Div. K, G. L. Hinerman, Pittsburgh & West Virginia Gas Co., Weston, W. Va.

Asst. Geologist, J. V. Goodman.

Supt. Comp. Stas., Judson Bonsall, Union Bank Bldg., Clarksburg, W. Va.

Asst. to Oper. Mgr., F. N. Wolf.

Supt. Gas Meas., D. B. Beecher.

Supr. Sys. Oper., G. H. Neilson, Jr.

Asst. Land Agt., H. H. Pigott.

Supt. of Telephones, V. H. Dake.

Miles of pipe lines owned and operated, transmission 1,246; distribution 84.

Philadelphia Oil Co., 435 Sixth Ave., Pittsburgh, Pa.

Supt., R. F. Dolen, Philadelphia Oil Co., Clarksburg, W. Va.

Public Service Co. of Oklahoma, Box 201 or Public Service Bldg., Tulsa, Okla.

Pres., Fred W. Insull.

V. P. in Chg. Prod., R. K. Lane.

V. P. and Tulsa Dist. Mgr., J. A. Whitlow.

Dist. Mgrs., W. H. Griffin, Okmulgee, Okla.; George Henkes, Henryetta, Okla.; W. B. Harris, Hugo, Okla.; Claude Porter, Okemah, Okla.; F. A. Darst, Vinita, Okla.; R. O. Downing, Atoka, Okla.; Grover Dick, Nowata, Okla.; A. B. Hubble, Broken Arrow, Okla.; C. A. Downing, Coweta, Okla.; H. F. Cameron, Bartlesville, Okla.; Harry Pitzer, McAlester, Okla.; C. N. Alexander, Pryor, Okla.; T. F. Reinold, Westville, Okla.

Miles of pipe lines owned or operated, 123.4.

Public Service Corp. of Texas, 500 Holmes Bldg., Fort Worth, Tex.

Pres., William Horwitz, Butler, Pa.-Fort Worth, Tex.

V. P., Thomas Cook, Amarillo, Tex.

Sec., W. J. McCaslin, Butler, Pa.

Treas., M. A. Berman, Butler, Pa.

Asst. Treas., S. B. Horwitz.

Asst. Sec., I. E. Horwitz.

Gen. Mgr., I. E. Horwitz.

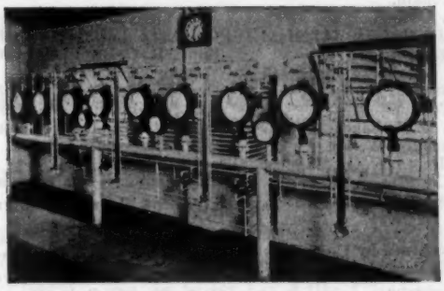
Supt., H. J. Boisdorf, Perryton, Tex.

Miles of pipe lines owned or operated, main line mileage 240.

Natural gas trunk pipe line system of the Panhandle Eastern Pipe Line Co. Top, western half; lower, eastern half

5 CUTS IN METER MAINTENANCE COSTS

Records prove that Foxboro Meters have the lowest maintenance cost of any meter. This, combined with their accuracy, dependability and long life make them the most economical instruments for gas measurement. Before buying meters, consider Foxboro's five reductions in meter maintenance expense.



One of the thousands of successful Foxboro METER Installations.

1. INSPECTION COSTS REDUCED. The Straight-Line Motion found only in Foxboro Meters means long periods of operation without attention. Large mercury displacement prevents dirt and sediment from disturbing the calibration. Hence, fewer inspections and less time spent on inspecting.

2. MERCURY LOSSES ELIMINATED. Each meter tested on an over-range more than 100 times its maximum differential. Check floats are submerged in mercury and the ground seats are mercury-protected from line scale, freezing, and corrosion. The floats seat positively and not one drop of mercury is lost.

3. LEAKS AND FRICTION ABOLISHED. The Pressure-Tite Bearing neither leaks nor binds, and needs no adjustment in the field. It is practically frictionless. No packing is used and the thrust of the shaft is taken on a jewel bearing.

4. CLEANING COSTS CUT. The meter is so easy to disassemble, clean, and reassemble that it is not necessary to remove piping or disturb the setting. It is just as easy to clean the 20-inch Meter as it is to clean the 50 and 100-inch Meters. *No re-calibration is necessary.*

5. TRIPS TO THE SHOP REDUCED. The stamina, inherent accuracy and inbuilt calibration of the Meter cuts necessary trips to the shop to a minimum. It is never necessary to send a Foxboro Meter to the shop for calibration. The patented Segmental Lever *has solved that problem for good.*

INSTRUMENTS FOR GAS SERVICE.
Orifice Meters—Saturation Controllers—Flow Controllers—Pressure Controllers—Indicating and Recording Pressure Gauges—Indicating Thermometers—Differential Limit Controllers.
WRITE FOR BULLETINS!

FOXBORO
REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

THE FOXBORO COMPANY, FOXBORO, MASS., U.S.A.
BRANCH OFFICES IN THE PRINCIPAL CITIES

INSTRUMENTS FOR THE PRODUCTION AND DISTRIBUTION OF GAS

R

Republic Light, Heat & Power Co., Inc., Jackson Bldg., Buffalo, N. Y.

V. P. and Gen. Mgr., S. B. Severson, 518 Jackson Bldg., Buffalo, N. Y.
Sec. and Treas., J. A. Richie, 518 Jackson Bldg., Buffalo, N. Y.
Div. Supts., W. B. Kopfer, Batavia, N. Y.; J. F. Sweeny, Dunkirk, N. Y.; P. H. Dole, Tonawanda, N. Y.
Egrs., J. J. Cowan, Tonawanda, N. Y.; G. M. Merrill, 518 Jackson Bldg., Buffalo, N. Y.
Asst. Sec., D. P. Spencer, 518 Jackson Bldg., Buffalo, N. Y.

Reserve Gas Co., 545 William Penn Way, Pittsburgh, Pa.

Pres., John B. Tonkin.
Gen. Mgr., H. C. Cooper.
Gen. Supt., W. B. Gribble, 445 Main St., Clarksburg, W. Va.
Asst. Gen. Supt., Charles C. Reed, 445 Main St., Clarksburg, W. Va .
Ch. Egr., L. L. Tonkin.
Supt. Pipe Lines, L. G. Kincheloe, 445 Main St., Clarksburg, W. Va.
Supt. of Meter Dept., J. G. Mallory, 445 Main St., Clarksburg, W. Va.
Miles of pipe lines owned or operated, 514.

Reserve Gas Corp. (Owned by Union Gas System, Inc.), Independence, Kans.

Pres., Paul R. Johnson.
V. P.s, Vernon F. Palmer and Frederick L. Rupp.
Treas., Hary F. Mitchell.
Sec. and Attr., Donald W. Stewart.
Gen. Supt. Trans. and Const., Livingston J. Love.
Pur. Agt., William L. Orr.

Retort Gas Co., P. O. Box 607, Bartlesville, Okla.

Pres., B. N. Zimmer, 61 Broadway, New York, N. Y.
V. P., William Simon, Boatmens Bank Bldg., St. Louis, Mo.
Sec. and Treas., Harold K. Hockschild, 61 Broadway, New York, N. Y.
Gen. Mgr., J. H. Surdoval.
Miles of pipe lines owned or operated, 15.

Rio Grande Valley Gas Co., Brownsville, Tex.

Pres., B. E. Hepler, 30 Broad St., New York, N. Y.
Sec. and Treas., J. T. Jackson, Mount Vernon, Ohio.
V. P. and Gen. Mgr., R. B. Lloyd.
Managing Egr., Hope Engineering Co., Mount Vernon, Ohio.

River Gas Co., 545 William Penn Way, Pittsburgh, Pa.

V. P. and Gen. Mgr., Howell C. Cooper.
Ch. Egr., Loring L. Tonkin.
Supt., R. C. Brown. Box 268, Marietta, Ohio.
Gen. Supt., W. B. Gribble. W. Main St., Clarksburg, W. Va.
Supt. Meters, J. G. Mallory, W. Main St., Clarksburg, W. Va.

Rocky Mountain Gas Co., Casper, Wyo.

President, John McFadyen, Box 120, Casper, Wyo.
H. O. Kapp, Rawlins, Wyo.
John D. Wilkie, Powell, Wyo.
John T. Fuller, Lovell, Wyo.
C. A. Stamm, Cody, Wyo.
W. W. Husted, Laramie, Wyo.

S

Sagamore Oil & Gas Co. (Owned by Union Gas System, Inc.), Independence, Kans.

Pres., Paul R. Johnson.
V. P.s, Charles W. Studt and Vernon F. Palmer.
Treas., Harry F. Mitchell.
Sec. and Attr., Donald W. Stewart.
Pur. Agt., William L. Orr.

Santa Maria Gas Co., P. O. Box 458, 203 W. Main St., Santa Maria, Calif.

Pres. and Gen. Mgr., R. E. Easton.
V. P., F. S. Wade, 810 S. Flower, Los Angeles, Calif.
V. P. and Sec., L. P. Scaroni.
Asst. Sec. and Gen. Auditor, C. W. Hatch.
Gen. Supt., Allen T. Fesler.
Asst. Gen. Supt., R. B. Bruce.
Miles of pipe lines owned or operated, December 31, 1933, 332.80, (not including services).

Smelter Gas Co., Bartlesville, Okla.

Pres., B. Elkan, 11 Broadway, New York, N. Y.
V. P. and Mgr., W. H. Gill.
Sec., Julian B. Beatty, 165 Broadway, New York, N. Y.
Field Supt., J. M. Moore.
Miles of pipe lines owned or operated, 50.

Southern California Gas Co., 950 S. Broadway, Los Angeles, Calif.

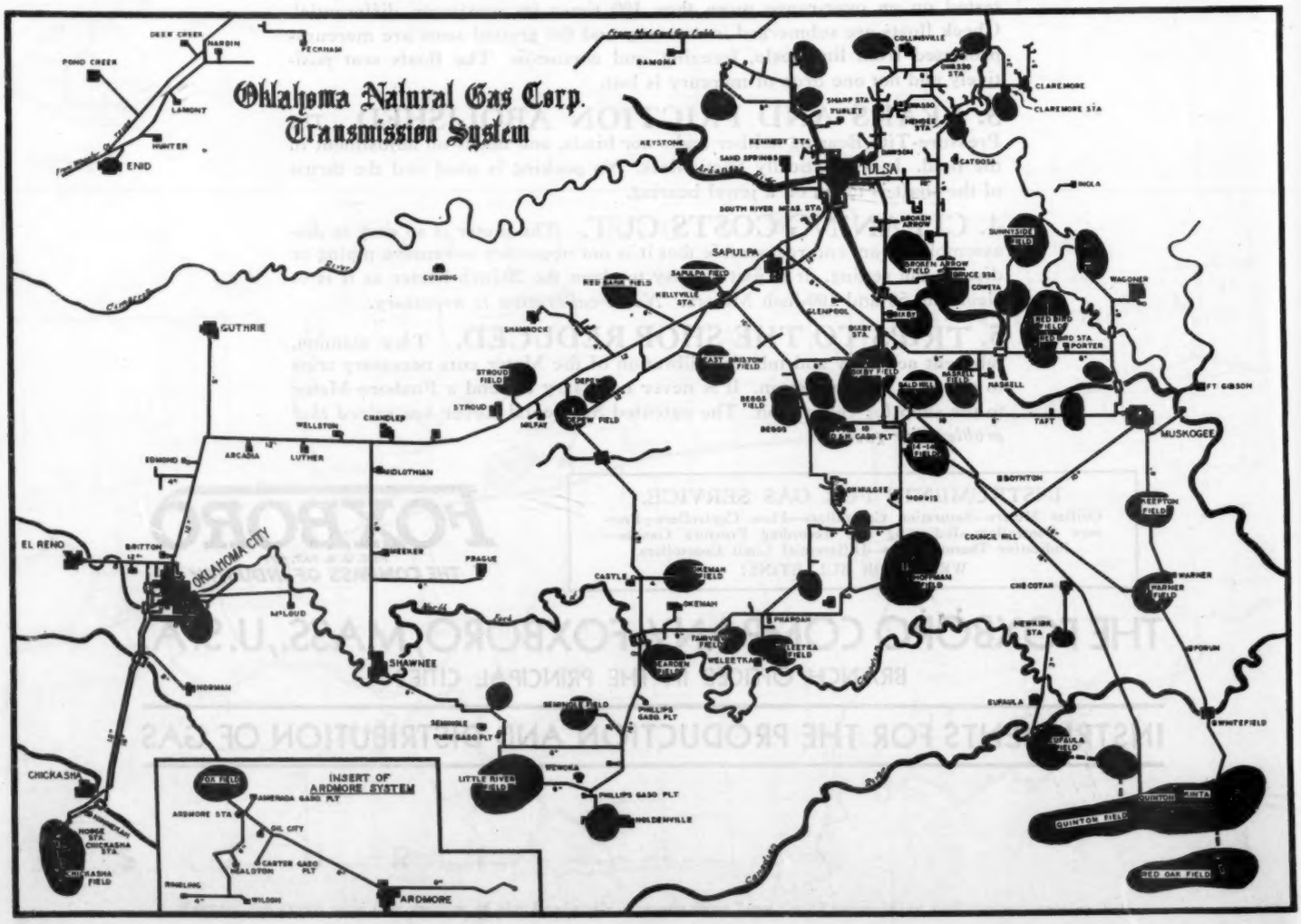
Pres., A. B. Macbeth.
V. P.s, A. C. Balch and Ben R. Meyer.
V. P. and Gen. Counsel, T. J. Reynolds.
V. P. in Chg. Mfg., Distr. and Sales, F. J. Schafer.
V. P. in Chg. Nat. Gas Prod. and Trans., William Moeller, Jr.
Sec., C. L. Whitehill.
Treas., L. D. Romig.
Directors, A. C. Balch, F. M. Banks, Garrettson Dulin, Harold Janss, A. B. Macbeth, Ben R. Meyer, C. O. G. Miller, R. W. Miller, William Moeller, Jr., Stuart O'Melveny, T. J. Reynolds and F. J. Schafer.
Gen. Supt. of Sales, F. M. Banks.
Gas Supr. and Office Egr., R. M. Bauer.
Spe. Egr., S. W. Binckley.
Supr., Per., Claims and Safety, R. R. Blackburn.
Supr. of Land Dept., A. L. Cleveland.
Auditor, G. A. Detrick.
Asst. Sec., E. W. Ellis.
New Business Mgr., C. M. Grow.
Gen. Sales Supr., W. M. Jacobs.
Supr., Adv. and Pub., D. M. Buckler.
Gen. Supt. Cust.'s Dept., F. C. Ingram.
Supr. of Purs., N. L. Morse.
Asst. Counsel, L. T. Rice.
Rate and Appr. Egr., E. H. Wetlaufer.
Paymaster, George Wade.

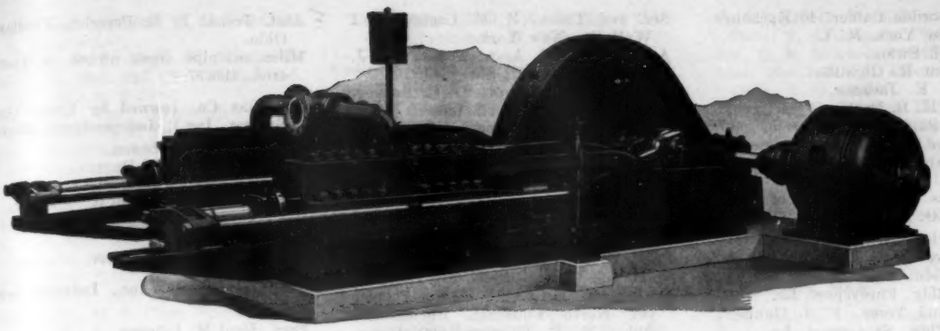
Los Angeles Operating Headquarters

Gen. Supt. Nat. Gas Prod. and Trans., H. P. George, 1700 Santa Fe Ave., Los Angeles, Calif.
Gen. Supt. Mfg. and Distr., Lee Holtz, 1700 Santa Fe Ave., Los Angeles, Calif.
Asst. Gen. Supt. Mfg. and Distr., 1700 Santa Fe Ave., Los Angeles, Calif.
Engr. Supr., B. M. Laulhere, 1700 Santa Fe Ave., Los Angeles, Calif.
Asst. Auditor, J. Q. Ewing, 1700 Santa Fe Ave., Los Angeles, Calif.
Unacc'd. for Gas Egr., L. L. Bigg, 1700 Santa Fe Ave., Los Angeles, Calif.
Civil Egr., J. W. Cleland, 1700 Santa Fe Ave., Los Angeles, Calif.
Supr. Meter Shops and G.O. 58, F. H. Coble, 1700 Santa Fe Ave., Los Angeles, Calif.
Ch. Gas Disp., E. L. Keasling, 1700 Santa Fe Ave, Los Angeles, Calif.
Gen. Storekeeper, G. C. Knox, 1700 Santa Fe Ave., Los Angeles, Calif.
Geologist, L. M. Spencer, 1700 Santa Fe Ave., Los Angeles, Calif.
Meas. Egr., B. G. Williams, 1700 Santa Fe Ave., Los Angeles, Calif.

Los Angeles Division—Division Headquarters—Los Angeles, Calif.

Act. Div. Supt., E. Henderson.
Supt. of Trans., J. R. Moore.



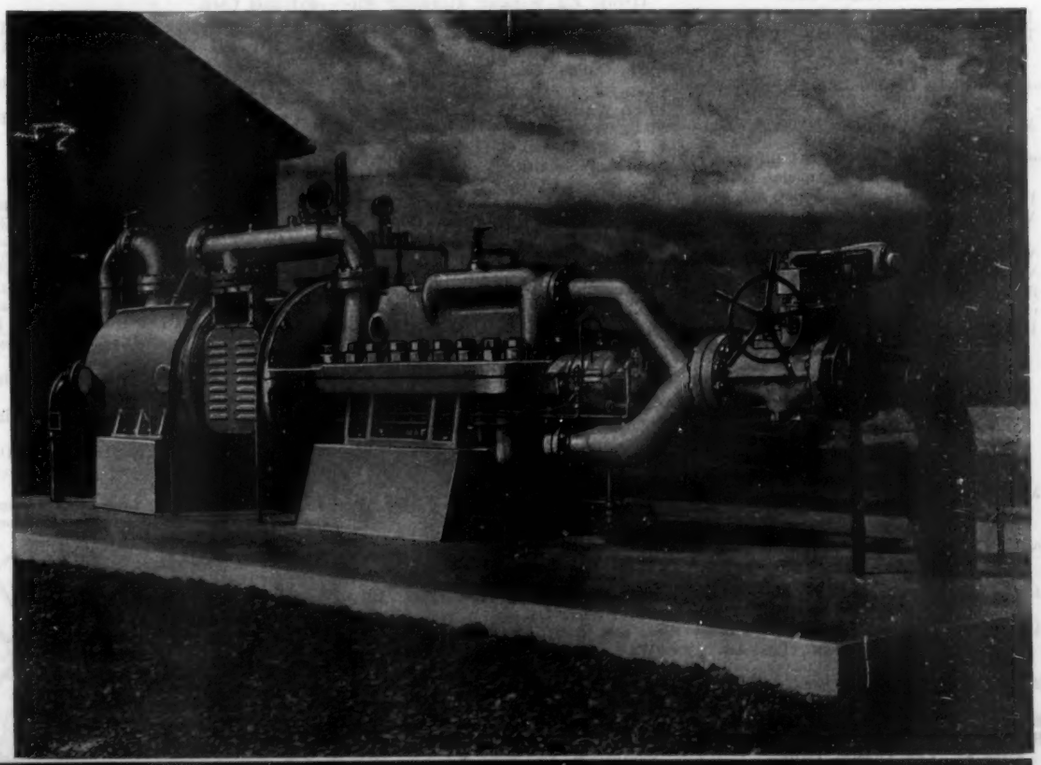


Pipe Line Pumps.....

CENTRIFUGAL PUMPING UNITS ★ PLUNGER PUMP UNITS

The new "Rannett" pipe line pump, weatherproof construction, liquid-cooled motor, introduced in 1932, of which there have been 18 built to date is now available in 3 sizes, 4″ x 4″, 6″ x 6″ and 8″ x 8″ with motors 200 h.p. to 700 h.p., capacities 6600 bbls. to 40,000 bbls. per day. These units have been giving uniformly satisfactory and efficient service. Allis-Chalmers also builds their type "M" double suction multi-stage pump for pipe line service using standard motors or for drive from oil engines thru gears. The type "M" pump was first applied to pipe line service in 1926.

A complete line of plunger as well as centrifugal pumps for oil pipe line service, is built by Allis-Chalmers Manufacturing Company. Forged steel pipe line pumps are designed and built for high pressures and heavy overloads. Pump ends have all oil passages machined from solid forged steel blocks. This type of pump is built in capacities ranging from 5,000 to 50,000 bbls. per day against pressures up to 1,000 lbs. The Company builds the complete units, either motor or engine driven.



Other Products:

Oil Well Countershaft Units
Motors and Control
Gas-Electric D.C. Drilling Rig
Texrope V-Belt Drives
Pumps { Centrifugal and Plunger
Tractors and Wagons
Air and Gas Compressors
Generators
Transformers
Vibrating Screens
Fullers' Earth Machinery
Power Plant and Electric Distribution Equipment
Industrial Machinery:
Crushing and Cement
Mining and Metallurgical
Flour Mill and Sawmill
Farm and Road
Timber Preserving
Coal Distillation
Boiler Treatment

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

Dist. Agts., H. L. Ziegelmeyer; A. L. Lynch, Beverly Hills, Calif.

Northern Division—Division Headquarters—Glendale, Calif.

Div. Mgr., S. C. Singer.
Div. Egr., A. B. Meyer.
Dist. Agts., R. S. Cheatham; W. O. Mulligan, Burbank, Calif.; G. W. Hackley, Van Nuys, Calif.

Southern Division—Division Headquarters—Redondo, Calif.

Div. Mgr., J. F. Murray.
Div. Supt., R. E. Haun.
Supt. of Distr., H. C. Abbott.
Dist. Agts., Paul Walters; W. G. H. Russell, Compton, Calif.

Eastern Division—Division Headquarters—San Bernardino, Calif.

Div. Mgr., H. C. McAllister.
Supt. of Trans., L. W. Jillson.
Supt. of Distr., J. S. Edwards.
Div. Egr., H. R. Meyer.
Dist. Agts., O. Jacobi; C. A. Gillespie, Riverside, Calif.; Hugo Tieck, Redlands, Calif.; E. A. Stowe, Banning, Calif.

San Joaquin Valley Division—Division Headquarters—Visalia, Calif.

Div. Mgr., C. M. Eyman.
Supt. of Distr., F. H. Biddington.
Div. Egr., H. M. Dwight.
Dist. Agts., George W. Wiley; C. K. Graham, Hanford, Calif.

Avenal Division—Division Headquarters—Avenal, Calif.

Div. Supt., J. W. Farner.
Div. Egr., C. E. Pickup.

Kern Division—Division Headquarters—Taft, Calif.

Div. Supt., W. C. Cameron.
Supt. of Trans., S. S. Donaldson.
Supt. of Distr., R. L. Cook.
Supt. of Prod., M. D. Pflieder.
Div. Egr., W. K. Dodd.
Dist. Agt., F. Fischer.

Newhall Division—Division Headquarters—Newhall, Calif.

Div. Supt., Arthur B. Newby.
Div. Egr., G. L. Lawrence, Ventura, Calif.

Southern Cities Distributing Co., Shreveport, La.

Mgr., P. F. McBride.

Southern Counties Gas Co. of California, 810 S. Flower St., Los Angeles, Calif.

Pres. and Gen. Mgr., Franklin S. Wade.
V. P., Pur., Sales and Pub. Rels., N. R. McKee.
V. P. Oper., A. F. Bridge.
V. P. Const., M. R. Thompson.
Sec., E. C. Cox.
Gen. Counsel, LeRoy M. Edwards.
Dist. Mgrs., Fred G. Merker, Santa Ana, Calif.; Walter G. Rich, Whittier, Calif.; Walter E. Keefe, Pomona, Calif.; Homer R. Mead, Monrovia, Calif.; Oliver R. C. Grow, San Pedro, Calif.; J. Clifford Gilbert, Santa Monica, Calif.; George W. Smith, Santa Barbara, Calif.; Carl Summers, Ventura, Calif.
Miles of transmission pipe lines owned and operated, 420.07.

Southern Fuel Co., 810 S. Flower St., Los Angeles, Calif.

Pres. and Gen. Mgr., A. B. Macbeth, 950 S. Broadway, Los Angeles, Calif.
1st V. P. and Asst. Gen. Mgr., F. B. Lewis, 601 W. Fifth St., Los Angeles, Calif.
2nd V. P., W. C. Mullendore, 601 W. Fifth St., Los Angeles, Calif.
3rd V. P., F. S. Wade.
Sec. and Treas., D. M. Trott, 601 W. Fifth St., Los Angeles, Calif.
Mgr. of Oper., H. P. George, 950 S. Broadway, Los Angeles, Calif.

Southern Natural Gas Corp., Watts Bldg., Birmingham, Ala.

Receivers, Hugh M. Morris and James H. White.
Pres., H. D. McHenry, 40 Exchange Place, New York, N. Y.
V. P., H. Gordon Calder, 40 Exchange Place, New York, N. Y.
Treas., H. S. Swan.
Sec., William R. Gignilliat.
Auditor, H. E. Jackson.
Gen. Supt., H. B. Pearson.
Asst. Gen. Supt., R. H. Ulrich.
Miles of pipe lines owned or operated, approximately 1,252.

Southwest Gas Utilities Corp. of Oklahoma, P. O. Box 270, Ada, Okla.

Pres., Charles G. Laskey, Slattery Bldg., Shreveport, La.
V. P. and Gen. Mgr., George Belchic, Slattery Bldg., Shreveport, La.
Asst. Sec. and Treas., F. J. Gaumer, Slattery Bldg., Shreveport, La.
Egr., M. C. Bubenzer, Slattery Bldg., Shreveport, La.
V. P. and Okla. Mgr., C. A. Breitung.
Div. Supt., W. O. Smith.
Auditor, R. C. Heard.
Div. Egr., D. H. Floyd.
Supr. of Trans., Lindsey Davidson.
Asst. Auditor, Wendell Thomas.
Total miles transmission lines, 73.

Southern Ontario Gas Co., Ltd., Jackson Bldg., Buffalo, N. Y.

V. P. and Gen. Mgr., S. B. Severson, 518 Jackson Bldg., Buffalo, N. Y.
Sec.-Treas., J. A. Richie, 518 Jackson, Bldg., Buffalo, N. Y.
Asst. Sec., D. P. Spencer, 518 Jackson Bldg., Buffalo, N. Y.
Div. Supt., W. J. Marriott, Leamington, Ontario.

Southern Pipe Line Corp.

Pres., H. A. Galt.
V. P.'s, William B. Bell, Clarence M. Brown, Harry L. Derby, Harry S. Wherrett.
Sec., J. Harold Heroy.
Asst. Sec., Howard B. Brown.
Treas., Frederick W. Currier.
Asst., Treas., David A. Pitcairn, P. G. Cramp.
Directors, William B. Bell, Kenneth F. Cooper, Harry L. Derby, Walter S. Landis, Howard B. Brown, Harry S. Wherrett, Hugh A. Galt, J. Harold Heroy, Eli Winkler, Raymond Pitcairn, Clarence M. Brown.

Southern Union Gas Co., 703 Browder St., Dallas, Tex.

Chm. Bd., C. W. Murchison.
Pres., Walter Reid.
V. P., Wofford Cain.
V. P. and Treas., C. H. Zachry.
Sec., F. W. Smith.
Asst. Sec. and Treas., E. O'N. Johnson.

Southwestern Light & Power Co., 502-504 Chickasha Ave., Chickasha, Okla.

Pres., Fred W. Insull, Box 1470, Tulsa, Okla.
V. P.'s, S. I. McElhoes, R. W. McClure, Box 627, Chickasha, Okla.; R. K. Lane, Box 1470, Tulsa, Okla.
Sec., A. M. McKinney, Box 627, Chickasha, Okla.
Treas., C. W. McIlhenny, Box 1470, Tulsa, Okla.
Auditor, P. H. Kuper, Box 1470, Tulsa, Okla.
Egr., W. Schumacher, Lawton, Okla.
Miles of pipe line owned, 227.6443.

Southwest Gas Co., Shreveport, La.

Pres., Charles G. Laskey, Box 101, Shreveport, La.
V. P., George Belchic, Box 101, Shreveport, La.
Sec. and Treas., R. M. Craigmyle, 1 Wall St., New York.
Asst. Sec. and Asst. Treas., F. J. Gaumer, Box 101, Shreveport, La.
Land and Legal Dept., D. C. Laskey, Box 101, Shreveport, La.
Egr., M. C. Bubenzer, Box 101, Shreveport, La.
Mgr., H. F. Adlam, Box 0, Lockhart, Tex.

Southwest Utilities Service Co., Shreveport, La.

Pres., Charles G. Laskey, Box 101, Shreveport, La.
V. P., George Belchic, Box 101, Shreveport, La.
Sec. and Treas., R. M. Craigmyle, 1 Wall St., New York.
Asst. Sec. and Asst. Treas., F. J. Gaumer, Box 101, Shreveport, La.
Land and Legal Dept., D. C. Laskey, Box 101, Shreveport, La.
Egr., M. C. Bubenzer, Box 101, Shreveport, La.
Mgr., C. A. Breitung, Drawer 2, Ada, Okla.

Springfield Gas Co., 99 North Front St., Columbus, Ohio.

Pres., C. I. Weaver.
V. P. and Gen. Mgr., E. M. Tharp.
V. P.'s, T. H. Kerr; E. D. Abbott, 101 North Fountain, Springfield, Ohio; T. B. Gregory, 800 Union Trust Bldg., Pittsburgh, Pa.
Treas., E. D. Bivens.
Sec., P. A. Alberty.
Asst. Sec. and Asst. Treas., P. A. Balliet.
Asst. Treas., N. E. Shupe, J. E. Parsons.

State Fuel Supply Co., 1320 Petroleum Bldg., Oklahoma City, Okla.

Pres., R. B. Crawford, Oil City, Pa.
V. P. and Gen. Mgr., F. S. Pratt, Oklahoma City, Okla.
V. P., M. T. Drisko, Oklahoma City, Okla.
Sec.-Treas., Ray K. Osborn, Oklahoma City, Okla.
Asst. Sec.-Treas., Earl J. Newlin, Oklahoma City, Okla.
Supt., G. R. Carpenter, Oklahoma City, Okla.
Dist. Mgr., C. L. Boone, Anadarko, Okla.
Dist. Mgr., T. R. Smith, Wewoka, Okla.

Susquehanna Gas Co., Allentown, Pa.

Pres., J. S. Wise, Jr.
Sec. and Treas., C. M. Walter.
Gen. Mgr., L. W. Heath, Williamsport, Pa.
Asst. Gen. Mgr., R. K. Tallant, Wellsboro, Pa.
Miles of pipe lines owned, 62.2.

Sylvania Corp.

Pres., George E. Welker, Oil City, Pa.
V. P., J. G. Montgomery, Jr., Oil City, Pa.
Sec. and Treas., H. S. Rose, Oil City, Pa.
Pur. Agt., M. J. Connor, Oil City, Pa.

T

Texas Gas Utilities Co. (wholly owned subsidiary of Commonwealth Gas Corp.).

Pres., John J. Klise, Wooster, Ohio.
V. P.'s, Marshall Eskridge, Smith-Young Tower, San Antonio, Tex.; H. L. Mann, Del Rio, Tex.; P. D. Koontz, Union Bldg., Charleston, W. Va.
Sec., F. R. Hurlbutt, Union Bldg., Charleston, W. Va.
Treas., C. F. Bauman, Union Bldg., Charleston, W. Va.
Asst. Sec.-Treas., R. H. Hurd, Del Rio, Tex.

Twin City Pipe Line Co. and Arkansas-Oklahoma Gas Co., 711 Garrison Ave., Fort Smith, Ark.

Pres., A. Lieberman.
V. P., H. L. Nickerson.
Treas., A. B. Harper.
Sec., S. R. Walker.
Miles of pipe lines owned or operated: Twin City Pipe Line Co., 100; Arkansas-Oklahoma Gas Co., 23.

U

Uinta Pipe Line Co., 539 South Main St., Findlay, Ohio.

Pres., T. B. Gregory, Pittsburgh, Pa.
V. P. and Sec., E. B. Redpath, Findlay, Ohio.
V. P., John McFadyen, Casper, Wwo.
Asst. Sec., Hal W. Stewart, Findlay, Ohio; J. A. Lee, Casper, Wyo.
Treas., F. B. Firmin, Findlay, Ohio.
Asst. Treas., L. C. Perschel, Findlay, Ohio.
Miles of pipe lines owned or operated, 190.17.

Union Gas Co. (owned by Union Gas System, Inc.), Independence, Kans.

Pres., Paul R. Johnson.
V. P., Frederick L. Rupp.
Treas., Harry F. Mitchell.
Sec. and Atty., Donald W. Stewart.
Gen. Supt. of Const., Livingston J. Love.
Pur. Agt., William L. Orr.

Union Gas System, Inc., Independence, Kans.

Pres., Paul R. Johnson.
V. P., Sec., Atty., Donald W. Stewart.
Treas., Harry F. Mitchell.
Gen. Mgr. P. L., Vernon F. Palmer.
Gen. Supt. Town Plant Distribution, Frederick L. Rupp.
Gen. Supt. Prod., Land and Ch. Geol., Charles W. Studt.
Gen. Supt. Transmission and Const., Livingston J. Love.
Pur. Agt. and Asst. Treas., William L. Orr.
Owns the following companies: Pioneer Pipe Lines, Inc., Union Gas Co., Osage Gas Producing Co., Sagamore Oil & Gas Co., Reserve Gas Corp.
Natural gas town plants in Kansas as follows: Altoona, Benedict, Buffalo, Burlington, Caney, Centerville, Coffeyville, Dearing, Elk City, Elk Falls, Erie, Fredonia, Independence, Lafontaine, Leroy, Liberty, Moline, Olathe, Spring Hill, Sycamore and Yates Center.

United Carbon Co., Union Bldg., Charleston, W. Va.

Pres., Oscar Nelson.
First V. P., G. A. Williams, Clarksburg, W. Va.
V. P.'s, T. S. Reed, Beaumont, Tex.; T. F. Koblegard, Weston, W. Va.
V. P. in charge of Land Dept., H. C. Pearson.
Sec., C. H. McHenry, Monroe, La.
Treas., T. A. Whelan, Weston, W. Va.
Asst. Treas. and Pur. Agt., C. A. Urban.
Asst. Sec. and Auditor, Arthur Hanson.
Counsel, Osman E. Swartz.
Ch. Chem., E. P. W. Kearsley.
Egr. and Gen. Pl. Supt., Hilding Hanson.
Gen. Supt., Ky. and W. Va., W. A. Williams, Weston, W. Va.
Gen. Supt., La. Div., H. W. Engstrom, Monroe, La.
Gen. Supt., Texas Div., E. H. Shinn, Borger, Tex.
Asst. Gen. Supt., Texas Div., C. E. McKinney, Borger, Tex.
Supt., Mont., E. E. Paterson, Molt, Mont.
Supt., Utah, S. I. Bennett, Cisco, Utah.
Supt., Gas. Div. and Gas Sales, La., H. E. Norrick, Monroe, La.
Gas Field Supt., L. S. Clemont, Monroe, La.
Meterman, La., C. Burkholder, Monroe, La.
Supt., W. Va., Darius Morris, Clendenin, W. Va.
Supt., W. Ky., R. S. Bailey, Campbellsville, Ky.

United Gas Public Service Co. and Subsidiaries, Rusk Bldg., Houston, Tex.

Pres., N. C. McGowen.
V. P., Prod. and P. L. Dept., R. H. Hargrove.
V. P., Distribution, J. V. Strange.
Industrial Sales, H. E. Randall.
Gen. Supt., P. L. Dept., M. A. Abernathy.
Asst. Gen. Supt., P. L. Dept., E. R. Cunningham.
Asst. Gen. Supt., P. L. Dept., Ed Parkes.
Supt. of Operations, Prod. Dept., B. M. Nowery.
Asst. to Supt., Prod. Dept., W. F. Hartwig.
Supt. Measurement, P. L. Dept., Ray Roundtree.

Supt. Comp. Stations, P. L. Dept., A. L. Bradford.
Ch. Disp., P. L. Dept., E. M. Smith.
Gas. Sales Mgr. and Ch. Chem., Prod. Dept., W. F. Fulton.
Asst. Oper. Mgr., Distribution Dept., H. P. Carroll, A. D. Kerr.
Mgr. Distribution Sales, Dean A. Strickland.
Publicity Mgr., H. C. Fiester.
Asst. to Pres., Gen. Staff, J. C. Flanagan, A. H. Warren.
Ch. Egr., Gen. Staff, A. D. Greene.
Comptroller, Gen. Staff, S. L. Davis.
Treas., Gen. Staff, L. V. Tracht.
Gen. Auditor, Gen. Staff, R. E. Hull.
Dist. Mgrs., H. F. Carr, Baton Rouge, La.; W. J. Quigles, Monroe, La.; F. E. Lacaze, Shreveport, La.; J. E. Bahan, Dallas, Tex.; W. H. Kearney, Houston, Tex.; E. F. Humes, San Antonio, Tex.; J. P. Rogers, Jackson, Miss.
P. L. Supts., P. L. Dept., J. G. Hicks, West Lake, La.; V. E. Turner, La Place, La.; P. G. Matthews, Beaumont, Tex.; H. C. McDonald, San Antonio, Tex.; Robert Wetzel, Wichita Falls, Tex.
Dist. Supt., P. L. Dept., J. D. Davis, Jackson, Miss.
Miles of pipe lines owned or operated, 4,906.

Upham Gas Co., 401 Union Bldg., Charleston, W. Va.

Pres., J. A. Upham, Mount Vernon, Ohio.
Field Supt., C. D. Jones, Mount Vernon, Ohio.
Supt. Meter Dept., W. L. Avis, Box 404, Charleston, W. Va.

United Natural Gas Co., 308 Seneca St., Oil City, Pa.

Pres., George E. Welker.
V. P., W. H. Locke.
Sec. and Treas., H. S. Rose.
Supt., J. G. Montgomery, Jr.,
Supt. of Distribution, P. L. Mulkin.
Pur. Agt., M. J. Connor.

Utah Gas & Coke Co., 45 South Main St., Salt Lake City, Utah.

Pres., L. B. Denning, Dallas, Tex.
V. P. and Gen. Mgr., J. D. Roberts.
V. P.'s, J. C. Donnell, 2d., Findlay, Ohio; T. B. Gregory, Pittsburgh, Pa.
Sec., D. E. Mitchell, Pittsburgh, Pa.
Asst. Sec., F. B. Firmin, Findlay, Ohio; L. C. Olpin.
Treas., F. B. Firmin, Findlay, Ohio.
Asst. Treas., D. E. Mitchell, Pittsburgh, Pa.; L. C. Olpin, V. E. Brooks.

W

Wagoner Gas Co., Wagoner, Okla.

Pres., M. B. Morgan.
Mgr., J. R. Johnston.
Supt., J. J. Cobb.
Miles of pipe lines owned or operated, 24.52.

Wasatch Gas Co., 45 South Main St., Salt Lake City, Utah.

Pres., L. B. Denning, Dallas, Tex.
V. P. and Gen. Mgr., J. D. Roberts, Salt Lake City, Utah.
V. P.'s, J. C. Donnell, 2d, Findlay, Ohio; T. B. Gregory, Pittsburgh, Pa.
Sec., D. E. Mitchell, Pittsburgh, Pa.
Asst. Sec., F. B. Firmin, Findlay, Ohio; L. C. Olpin.
Treas., F. B. Firmin, Findlay, Ohio.
Asst. Treas., D. E. Mitchell, Pittsburgh, Pa.; L. C. Olpin, V. E. Brooks.
Local Mgr., Boyce Rawlins, Provo, Utah.
Miles of pipe lines owned and operated, 298.42.

West Michigan Consumers Co., Box 394, Muskegon, Mich.

Chm. Bd., L. C. Walker.
Pres., Myron H. Powell.
V. P., Ira A. Wyant.
Sec. and Gen. Mgr., John L. Robinson.
Treas., Louis Lunsford.
Supt., Carl Long.
Miles of pipe lines owned and operated, 35.

Wayne United Gas Co. (subsidiary of Commonwealth Gas Corp).

Sec., F. R. Hurlbutt, Union Bldg., Charleston, W. Va.
Treas., C. F. Bauman, Union Bldg., Charleston, W. Va.
Receivers, Herman Bennett and Ross B. Thomas, Union Bldg., Charleston, W. Va.

Weleetka Pipe Line Co., Sand Springs, Okla.

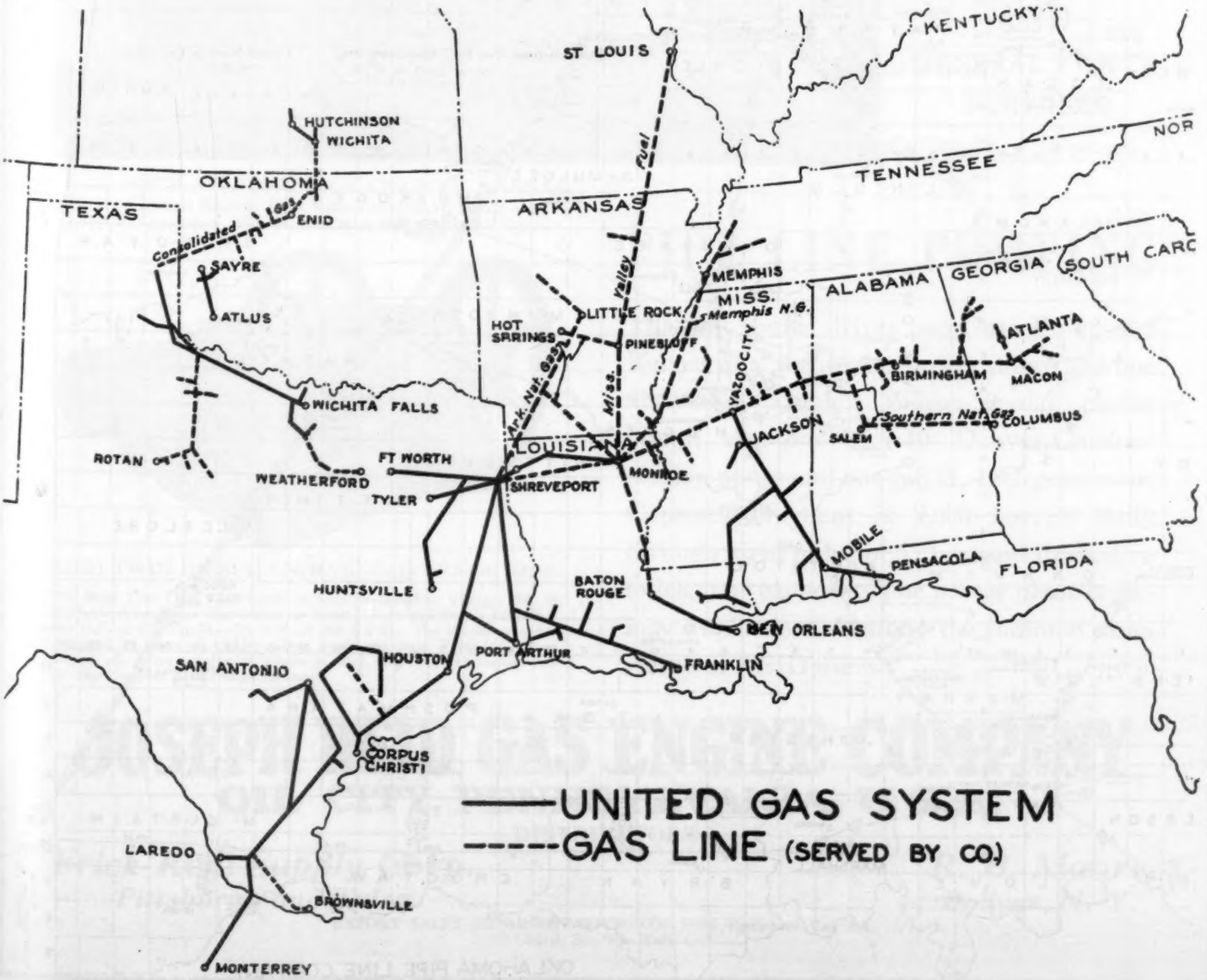
Pres., W. B. Head, Jr.
V. P., D. V. Sullivan, Okemah, Okla.
Sec.-Treas., G. W. Evans.
Asst. Sec.-Asst. Treas., C. F. Colvin.
Miles of pipe lines owned and operated: Transmission, 15.3; gathering, 2.7.

Western Gas Co., Tenth Floor, Bassett Tower, El Paso, Tex.

Pres., Paul Kayser, 906 Chronicle Bldg., Houston, Tex.
V. P. and Gen. Mgr., H. G. Frost, 906 Chronicle Bldg., Houston, Tex.
V. P. and Asst. Gen Mgr., C. C. Cragin.
V. P. and Gen. Supt., A. L. Forbes, Jr.
Asst. Sec.-Treas., J. E. Franey.
Main Line Supt., C. O. Byrne.
Arizona State Mgr., D. H. Tucker, 814 Title & Trust Bldg., Phoenix, Ariz.
Industrial Egr., C. C. Tucker.
Supt. of Measurements, R. H. Cowan.
Pur. Agt., W. R. Hall.
Miles of pipe lines owned and operated, 523.53.

Western Public Service Corp., Findlay, Ohio.

Chm. Bd., G. W. Crawford, Pittsburgh, Pa.
Pres., O. D. Donnell.
V. P.'s, J. C. Donnell, 2d; R. M. Redding, Dallas, Tex.; L. B. Denning, Dallas, Tex.; T. B. Gregory, Pittsburgh, Pa.; J. M. Simpson, Pittsburgh, Pa.; Clyde Jones, Pittsburgh, Pa.



Sec., D. E. Mitchell, Pittsburgh, Pa.
Asst. Sec., E. B. Redpath, F. B. Firmin.
Treas, T. B. Gregory, Pittsburgh, Pa.
Asst. Treas., E. B. Redpath, F. B. Firmin, D. E. Mitchell, Pittsburgh, Pa.

West Michigan Consumers Co., Muskegon, Mich.

Mgr., J. L. Robinson.
Supt., Carl Long.

West Texas Gas Co., Box 637, Amarillo, Tex.

Pres., Albert R. Jones, Kansas City, Mo.
V. P. and Gen. Mgr., R. F. Hinchey, Lubbock, Tex.
V. P.'s, H. A. Meyer, Tulsa, Okla.; M. D. Snyder.
Sec.-Treas., George Baird, New York.
Asst. Sec.-Treas., L. W. Bell, Lubbock, Tex.
Asst. Sec., E. A. Sickels, Tulsa, Okla.
Ch. Egr., W. W. Rusk.
Supt., C. R. Miner, Lubbock, Tex.

West Virginia Gas Corp. (subsidiary of Commonwealth Gas Corp.).

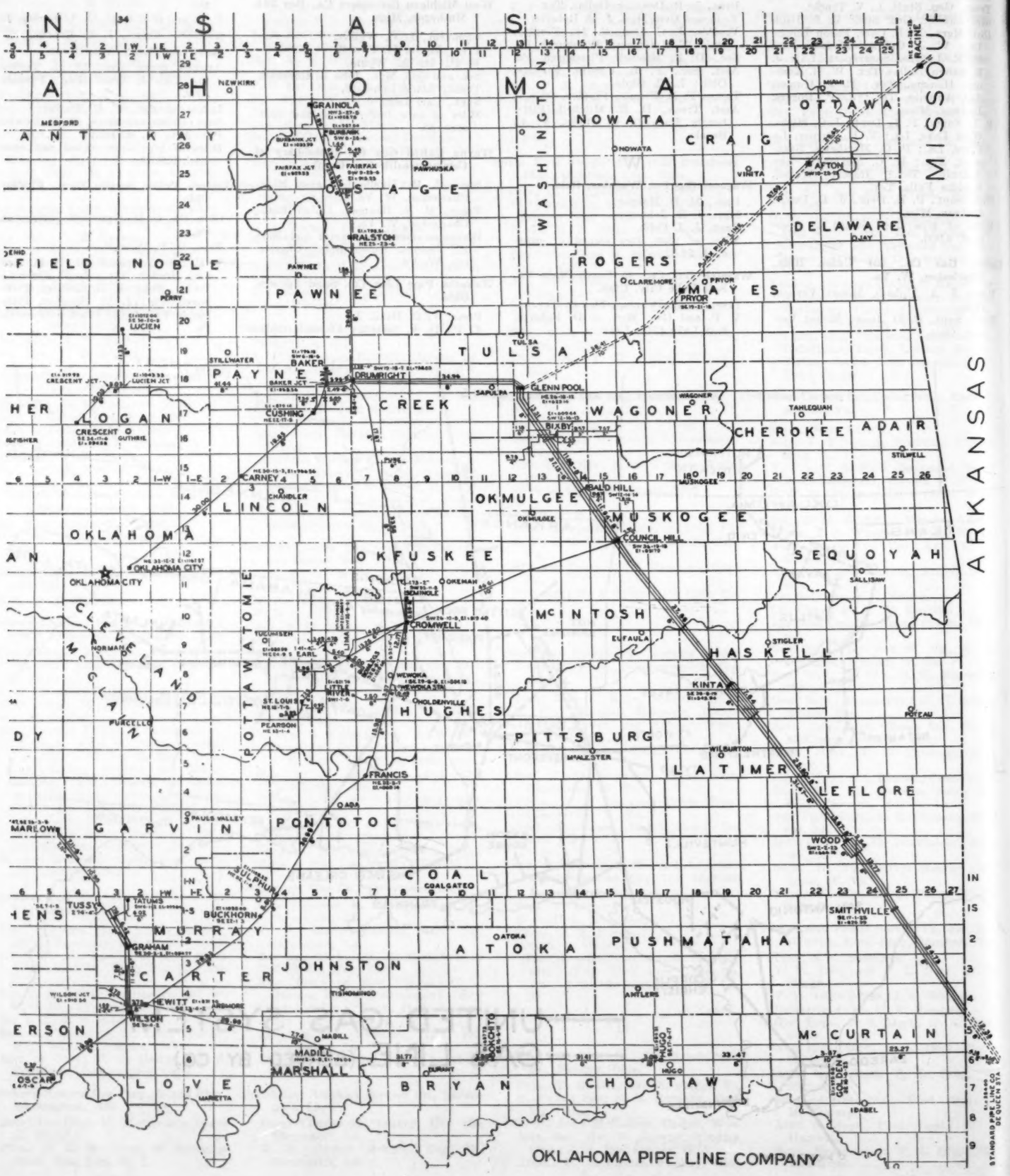
Pres., John J. Klise, Wooster, Ohio.
V. P.'s, P. D. Koontz, H. B. Lambert, Union Bldg., Charleston, W. Va.
Sec., F. R. Hurlbutt, Union Bldg., Charleston, W. Va.
Treas., C. F. Bauman, Union Bldg., Charleston, W. Va.

Wheeler Gas Co., Wheeler, Tex.

Owner and Mgr., H. M. Wiley.
Miles of pipe lines owned or operated: Transportation, 45; distribution, 10.

Wichita Gas Co., Wichita, Kans.

Supt., J. J. Schubert.
Egr., C. F. Morris.
Const. Foreman, H. F. Goode.
Shop Foreman, F. E. Skinner.



REID FULL DIESEL ENGINES

for driving

PIPE LINE PUMPS

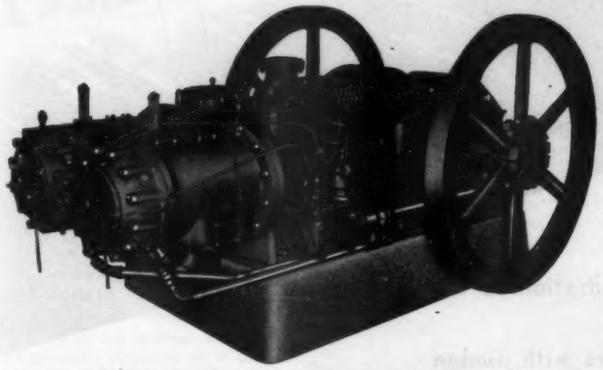
COMPRESSORS

GENERATORS

AND

GENERAL POWER PURPOSES

RICE STATION, RICE COUNTY, KANSAS.
Central Kansas Pipe Line Company's pump station powered with Reid Twin Full Diesel Engine.



REID TWIN DIESEL ENGINE—GOVERNOR SIDE

The Reid Type D.C. Twin Diesel is fully described in Bulletin No. 58 available through our distributors or direct. Bore and Stroke 12½x16—100 H.P. at 225 R.P.M.—150 H.P. at 300 R.P.M. The oil industry has indicated its approval of this power plant and Reid Type D.C. Twin Diesels are giving satisfaction wherever used. We invite correspondence in regard to your power requirements.

PIPE LINE PUMPING

The unit shown drives one Gaso Pump and Burner 5″ x 10″ duplex power pump and one 4½″ x 12″ Duplex Wilson-Snyder power pump; also one 8″ x 10″ Denver-Gardner suction pump and one 5 KW. DC. generator. Capacity of plant is 9,000 barrels daily through eight miles of 5″ line and thirty-five miles of 6″ capacity. The power plant is giving complete satisfaction—the common experience of REID users.

JOSEPH REID GAS ENGINE COMPANY

OIL CITY, PENNSYLVANIA, U. S. A.

DISTRIBUTORS

Frick-Reid Supply Corp.,
Pittsburgh and Tulsa.

R. B. Moore,
Bolivar, N. Y.

EXPORT SALES REPRESENTATIVE: Oil Field Equipment Co., Inc., 30 Church St., New York City.

TIMKEN metallurgists have developed special high-temperature, creep-resisting alloy steels that are setting new performance standards in cracking furnaces, heat exchangers and other types of refinery equipment.

These steels combine the best features of the older refinery tube steels with new and higher qualities resulting from Timken's advanced metallurgical thought and specialization in the refinery field.

Fabricated into tubes with Timken accuracy under Timken methods of quality control, they mean extended service and increased safety for every refinery operator who uses them. Specify Timken Refinery Tubes for your next requirements and prove their superiority to your own satisfaction.

THE TIMKEN STEEL AND TUBE COMPANY, CANTON, OHIO

District Offices or Representation in the following cities: Detroit Chicago New York Los Angeles Boston Philadelphia Houston Buffalo Rochester Syracuse Tulsa Cleveland Erie

World's Largest Producer of Electric Furnace Steel

TIMKEN STEEL TUBES

ELECTRIC FURNACE AND OPEN HEARTH - ALL STANDARD AND SPECIAL ANALYSES

NEWS FOR PETROLEUM REFINERS

Grease Makers Elect New Officers and Directors

CHICAGO, Oct. 20.—With more than 90 per cent of the grease industry of the United States represented, the National Association of Lubricating Grease Manufacturers held its second annual convention at the Stevens Hotel here, October 16 and 17. Officials reported the organization was mapping out a constructive program for the industry.

It was announced that Dan S. Hunter had been selected as executive secretary of the association. From his headquarters in the Keith Building, Cleveland, Ohio, he will proceed at once with his duties of developing the organization into a closely knit one around the plans being worked out. Further information as to association plans will be announced later.

M. B. Chittick, assistant chief chemist of Pure Oil Co., was elected president for the coming year. He succeeds J. R. Battenfeld, Battenfeld Grease & Oil Corp., Kansas City, Mo. Other new officers are: W. H. Saunders, Jr., International Lubricants Corp., New Orleans, vice president; Guy Peters, Oil-Kraft, Inc., Cincinnati, secretary, and E. V. Moncrieff, Swan-Finch Oil Corp., treasurer.

New directors elected were: C. D. Karnes, Standard Oil Co. of New Jersey; Mr. Saunders; H. F. Wilhelm, Socony-Vacuum Oil Co., Inc.; Guy Peters; Frank Kerns, Texas Co.; E. V. Moncrieff; L. C. Welch, Standard Oil Co. of Indiana; James R. Corbett, Cato Oil & Grease Co., Oklahoma City, Okla.; Mr. Marshall, Shell Oil Co. of California; W. E. Callaghan, Motor State Oil & Grease Co., Jackson, Mich; L. B. Lochridge, Sinclair Refining Co.; George Miller, American Lubricants Corp., Buffalo; M. B. Chittick; J. R. Battenfeld and F. J. Snyder, Fiske Brothers Refining Co., New York City.

Iso-Octane to Be Produced in Commercial Quantities

Tri-methyl-iso butyl-methane, a pure hydrocarbon discovered in 1927 as the "perfect fuel" and since used as a yardstick to measure the antiknock properties of gasoline, can now be produced commercially and will soon be available for compounding in aviation fuel, it was announced by Frank A. Howard, president of the Standard Oil Development Co.

The perfection of the process to manufacture the valuable chemical on a commercial scale not only will give the aviation industry room to expand the power and speed of its ships without danger of detonation, it is said, but will open up new possibilities in the acceleration, speed and power of automobiles hitherto untouched by even the highest compression engines.

Iso-octane, as the substance is popularly known, was originally developed by Dr. Graham Edgar, research director of the Ethyl Gasoline Corp. It was so difficult and costly to produce that the sample had to be preserved much like the standard foot-rule in the government bureau at Washington. For the past six years iso-octane, with an arbitrary rating of 100, has been the theoretical perfection toward which oil refiners reached in developing antiknock gasoline.

"In recent years," Mr. Howard declared, "the average knock rating or octane number of ordinary gasoline has been raised to as high as 70. Not only has this made possible an increase of 50 per cent in the power and speed of low priced automobiles within the last nine years, but today for the first time the average car in good condition runs on regular quality gasoline with a complete absence of knocking.

"In aviation, however, it is a different story. The last bit of power is demanded from the smallest engine weight. This has led to a steady increase in compression ratio which in turn has demanded still higher octane gasoline from the oil refiner. There is a limited supply of natural crudes from which 72 to 75 octane number aviation fuel may be obtained. By the addition of tetraethyl lead this can be raised to about 85 to 90, which has been the commercial limit. The airplane manufacturer has been crowding this limit so closely that the air pilot as a matter of course has to expect performance that is always close to the ragged edge of detonation or knocking when the throttle is wide open.

"We have found pure iso-octane, which will be available in commercial quantities next year, will make a 100 octane number fuel—perfect knock performance—when mixed with ordinary aviation gasoline in 50-50 proportions with the addition of the usual quantity of tetraethyl lead."

Sinclair Prairie Burbank Area Employes Celebrate High Safety Attainment

The record of 1,000,000 man hours of natural gasoline plant and oil field labor without a disabling injury stands as a remarkable credit to organized safety in the oil industry. This accomplishment was realized October 1, 1934, by the Burbank district employes of the Sinclair Prairie natural gasoline and production departments. The million man hours consisted of gasoline plant operation, tank cleaning, drilling and plugging wells, pulling and running strings of rods and other duties falling under routine production work.

During this period 35,000,000 gallons of natural gasoline were manufactured; enough to load a 25-mile train of 4,384 tank cars. In the production department, 13 wells averaging 3,000 feet were drilled, 27 wells were plugged and 1,776,346 bbls. of crude oil was produced. This crude production represents approximately a year's allowable for the entire Burbank Field.

In recognition of the success of the safety program in the Burbank area, a celebration was held October 22 by officials and employes of the company. During a short program in the Shidler high school auditorium, a safety certificate was presented the chapter. Speakers included Don Wallace, safety director of the company; Superintendent L. M. Kelsey of the gasoline department, Production Superintendent John W. Stoker, and Logan Scott and Harry E. Fulten, representing the workmen.

A barbecue followed, together with entertainment and music by the chapter band. A section of the Sinclair Prairie golf course with bandstand, tables and pits was the site of this event.

The safety work of the Sinclair Prairie Oil Co. is carried on through safety chapters in every district, the first having been organized in the Burbank district in 1925. While the 1924 accident record for this district shows 122 injuries, the whole-hearted support of the safety program of Superintendents Kelsey and Stoker, as well as their men, produced an immediate and continued reduction in the number of accidental injuries. By 1928 accidents had become so uncommon as to suggest the possibility of their complete elimination. The million man hour goal was then set and began December 16, 1929, when the last injury to date occurred.

SINCLAIR PRAIRIE OIL COMPANY
CERTIFICATE
In recognition of having completed more than one million consecutive man hours of work in the production and gasoline departments in the Shidler-Burbank field without disabling or lost-time injury to any employee, this certificate is hereby given.
Tulsa Oklahoma October 22, 1934
Attest:

This shows the certificate awarded the Shidler Safety Chapter for its record attainment. In the insert are (left) L. M. Kelsey, superintendent of the gasoline department, and (right) John W. Stoker, production superintendent, both of Shidler

Eastern Oil Burner Dealers Form Separate Association

NEW YORK, Oct. 20.—Important changes took place here this week in the organization of the oil burner industry which has been on an unsatisfactory basis for the past several months. At a meeting held Wednesday the organization of the National Oil Burner Dealers Association was perfected with the election of Leonard C. Smyth of Montclair, N. J., president, and Arthur W. Clark, executive director. The latter with a staff will devote his entire time to the work of the association with headquarters at 551 Fifth Avenue, New York City.

The new association takes the place of the dealer division of the American Oil Burner Association. For the present the membership is confined to dealers in this section of the country. It is planned, however, to expand the membership to the larger market centers and a national organization will be perfected next March when a general meeting will be held. A national show probably will be held at this time.

It has been felt for some time that the best interests of the manufacturers and dealers would be served through separate organizations. In recent months there have been complaints regarding the merchandising activities of some manufacturers who have been by-passing the dealers in sales to consumers and who also have tied in oil distribution with burner sales selling the latter at prices including terms with which the average dealer cannot compete.

The directors of the American Oil Burner Association at a meeting this week approved the action of the dealers and assured the dealers of co-operation in their program which has the general aim of strengthening the position of the dealer in the oil burner industry. At the meeting of the A.O.B.A. directors Harry F. Tapp, who has been managing director of the association for several years, resigned effective October 31.

At the meeting the directors took under consideration a plan to affiliate with the National Electrical Manufacturers Association as an oil burner division. The action is favored by some due to the close contact with the electrical industry in burner manufacture including air conditioning. The latter and oil heat are becoming more closely associated in installations in homes.

LLOYD TO INSTALL DUBBS UNIT

CHICAGO, Oct. 20.—L. B. Lloyd, president of Lloyd Refineries, Ltd. of Canada, has just signed a license contract with Universal Oil Products Co. and will erect a Dubbs cracking unit in connection with his skimming plant at Port Credit, 12 miles from Toronto, Ontario. The unit will be built under supervision of Universal engineers.

The refinery is now running about 1,500 bbls. a day of Michigan crude, which is barged to Port Credit from Bay City, Mich.

The Dubbs cracking unit is to be of the full flashing type. The initial capacity will be 700 bbls. a day, but it will be designed to allow increasing the capacity later if desired. It may be operated to produce a specification fuel oil or apparatus for continuous production of a superior grade of coke may be installed. Various methods of operation are being considered by Mr. Lloyd in consultation with Universal engineers.

As at present operated the plant is producing straightrun gasoline, cleaners' naphtha, kerosene, burner distillate and fuel oil.

First Oriskany Sand Producer in West Virginia; Eighteen Completions in the Eastern Fields

By STAFF CORRESPONDENT

PITTSBURGH, Pa., Oct. 22.—In Elk district, Kanawha County, West Virginia, Grosscup and others ran the bailer in the Oriskany sand producer on the W. L. Burdette farm and the well responded by making a flow of about 165 bbls. or about the fluid content of the hole. This will facilitate the running of the 5-inch casing which is ready, after which the well will be drilled in as it is barely in this formation. It is about a quarter mile up Coopers Creek from the mouth and is of interest as it is the first Oriskany sand producer in the state. About a half mile farther up the stream, S. B. Avis, trustee for Grosscup and others, is drilling on the Copen heirs farm and has reached 410 feet.

There were 18 completions in the lower eastern fields during the week and also 9 dry holes. Six of the completions were producers and the 12 gas wells were all small. The largest producer was in Southeast Ohio where there were only five completions and one dry hole.

SOUTHEAST OHIO

In Coshocton County, a fair producer was completed by Pure Oil Co. on the Ray Hays farm in Section 5, Perry Township. It was No. 4 and was drilled in the Clinton sand to 3,228 feet and, after shot, produced 65 bbls. the first day.

In Athens County, A. D. Townsend and others completed a test on the Leo Douglas heirs farm near Jerseyville in Section 22, Lodi Township. It is a shallow Maxon sand well at 644 feet and has an initial volume of about 500,000 feet a day.

In Knox County, Upham Oil & Gas Co. completed a test on the Solomon Rice farm in Section 20, Butler Township. It is a fair gas well in the Clinton sand at 3,260 feet and gauges about 750,000 feet a day.

In Medina County, D. A. Lake completed No. 19 on the Pearl and Frank Weaver farm in Section 1, Litchfield Township. It produced 10 bbls. the first day after shot from the Berea grit at a depth of 370 feet.

In Noble County Barry Rich and others drilled a second test on the W. H. Williams farm, SW Section 19, Seneca Township. It had a slight showing of a very dark oil in the Berea grit at 1,615 feet with a badly broken sand. It was shot but nothing was added. It is about 500 feet due south of the No. 1 same farm.

In Washington County, J. T. Campbell and other completed a second test on the Gilbert King heirs farm in Section 8, Lawrence Township. It is a gas well in the Injun sand at 1,635 feet and is making about 1 bbl. a day. The gas gauges about 200,000 feet a day, and the well is about 700 feet north of No. 1, same farm.

SOUTHWEST PENNSYLVANIA

There were two gas wells and one dry hole reported from Southwest Pennsylvania. The more important is the dry hole. In Amwell Township, Washington County, Carnegie Natural Gas Co. drilled the test on the A. M. Cole farm to a total depth of 3,372 feet and except for one small showing of gas, it was dry in all formations. The Fifth sand, or in this district the oil formation, extended from 2,968-98 feet and was dry. It proved dry through the Bayard sand. In this township the same company is building a road to the location on the Robert M. Carrons farm and on the M. C. Manon farm there is a rig completed for a second test. No. 1 was a gas well. In this township, Manufacturers Light & Heat Co. is drilling on the R. A. Rankin farm which has reached 1,180 feet. It offsets the fair gas well on the C. W. Farabee farm.

In Greene County, Natural Gas Co. of West Virginia completed a second test on the Peter Ashby farm in Richhill Township at a total depth of 1,616 feet. Top of the Salt sand was at 1,591 feet with gas showing at 1,592 feet. The volume is estimated about 300,000 feet a day.

In Franklin Township, Washington County, Manufacturers Light & Heat Co. drilled deeper No. 1 on the J. W. Moss heirs farm to a total depth of 2,157 feet. The Maxon sand was at 1,957 to 2,040 feet with about 348,000 feet a day of gas showing at 1,980 feet.

In East Township, Washington County, Union Gasoline & Oil Corp. is drilling deeper No. 1 on the J. S. Hazlett farm which had been a gas well in the Nineveh Thirty-foot sand. The Fifth sand was at 2,917-50 feet with a showing of oil at 2,922 feet. It is yet undecided whether it will be shot. In this township, Myers, Hoskinson and others are ready with the tools to start No. 1 on the M. C. Francis farm.

In South Franklin Township, Washington County, Carnegie Natural Gas Co. is starting to drill deeper No. 1 on the S. A. Dague farm down to the Fifth sand. It is now at 2,675 feet. In North Franklin Township, E. H. and J. B. Tague have a rig standing on the E. H. Grim farm which is about 300 feet north of their Dunkard sand producer No. 2 on the Adaline D. McKennan estate.

In Greene County, Wasmuth and Callahan are drilling deeper No. 1 on the Mary Bell Durbin farm in Richhill Township and beginning at 1,408 feet, the depth is now 1,500 feet. In this township, No. 3 of Guy Patterson on the T. M. Ross farm is drilling at 1,575 feet. F. D. Freeland and others are drilling on the E. A. McCord farm which has reached 425 feet. In Dunkard Township, the Vance leases are down 1,020 feet on the James and Willis Vance farm. The Pittsburgh Coal was at 866 feet.

WEST VIRGINIA

There were four producers completed in West Virginia. In Ritchie County, in the lower end of the Pike Pool, J. C. Smith and others completed a second test on the Lewis Hanlon farm in the Injun sand at a depth of 1,900 feet, showing for 25 bbls. a day. In Clay district, same area, Ralph Roberts completed No. 1 on the William Mercer town lot in the same formation at 1,833 feet, showing for 8 bbls. a day.

In Roane County, Reedy Oil & Gas Corp. completed No. 6 on the L. M. Riddle farm in Curtis district in the Salt sand at a depth of 1,755 feet. It is showing for 20 bbls. a day and is about 600 feet south of No. 2.

In Wood County, on Pleasant Hill in Walker district, Pleasant Hill Gas Co. completed No. 3 on the Elmer Marshall farm in the Maxon sand and has a producer good for 1 bbl. a day.

Gas Wells

In Boone County, Pure Oil Co. completed a second test on the Lafollette, Robson and Prichard Tract C in Sherman district in the Weir sand at 2,671 feet. It will make a light gas well.

In Calhoun County, Knotts Oil & Gas Co. completed a test on the Phillip Cottrill farm in Washington district in the Salt sand at a depth of 1,404 feet. It is a small gas well. In Center district, H. V. Burt drilled deeper No. 1 on the Beeman Wright farm through the Berea sand which proved dry. It will be tubed back to the Injun sand.

In Gilmer County, Center district, West Virginia Utilities Corp. completed a test on the John J. Gerwig farm in the Berea sand at a depth of 2,260 feet. It is a gas well gauging about 55,000 feet a day, natural. In this district, Verle Stuart and others drilled a test on the S. H. Miller farm about 15,000 feet southeast of the Hope Construction & Refining Co. lease on the John R. Simmons farm and it will make a gas well in the Maxon sand at a depth of 1,792 feet. In the same district, about 5,000 feet east of the producer on the Emma Ryan farm, Godfrey L. Cabot, Inc., completed a test on the R. W. Bennett farm as a gas well in the Berea sand at 2,250 feet. In this district McCall Drilling Co. drilled No. 5 on the L. R. Moore farm through the Berea sand to 2,805 feet. It was dry and is being abandoned. In DeKalb district the same operators drilled deeper No. 3 on the Riddle Brothers farm through the Injun sand to 2,120 feet. It was dry and is being tubed back to the Maxon sand gas. In Troy district, Harley Satterfield completed a test on the John Ralston farm through the Injun sand to 1,997 feet. It was dry.

In Pleasants County, Sud Powell and others drilled a test on the R. H. Brouse and Ralph Hanes farm in McKim district through the Squaw sand to 1,695 feet. It was a dry hole.

In Ritchie County, H. N. Rinehart completed No. 6 on the J. B. Markey farm in Grant district in the Injun sand at a depth of 1,905 feet. It will make a small gas well.

In Roane County, O. G. Epling completed a test on the L. P. Starr farm in Spencer district in the Injun sand at 2,216 feet. It is a gas well gauging about 200,000 feet a day and has a small showing of oil. On Buffalo Creek in Curtis district, about 3½ miles north of the L. M. Riddle farm, E. R. Lester and others drilled No. 1 on the O. M. Tatterson farm through the Berea sand. It was dry.

Drilling in West Virginia

In Boone County, Pure Oil Co. is drilling a second test on the Pocatello Coal & Coke Co. tract in Crook district. This company is drilling No. 69 on the Federal Coal Co. lease, rigging up for No. 70 and building a rig for No. 71. Columbia Carbon Co. has reached 1,960 feet in No. 7 on the Broun Cochran lease, same district. In Washington district, Godfrey L. Cabot, Inc., is down 1,600 feet in the second White and Hopkins well. Pond Fork Oil & Gas Co. has rigged up for No. 19 on the Cole and Crane lease.

In Calhoun County, Starcher & Richards have made a location on the Graybell heirs farm in Sherman district. I. B. Fowler and others are down 935 feet on the I. B. Fowler farm. F. F. McIntosh is drilling at 680 feet on the Seymore Settle farm, a test. In Lee district, this operator is down 895 feet on the E. L. Hays farm. Jarvis and Ayers are drilling at 1,450 feet on the Roanna Robinson farm after a long fishing job. Same operators have part of the material on the ground for a test on their own property. In Washington district, Godfrey L. Cabot, Inc., is building a rig for No. 3 on the G. W. Truman farm. Harley Jarvis and others are drilling at 710 feet on the Clark Wilson farm, a test. W. B. Reed and others have reached 1,265 feet on the Curtis and Ella May farm. In Sheridan district, Harley Ferrell and others are drilling on the T. J. Jackson farm and have reached 310 feet. Bickerstaff and others have started drilling No. 5 on the William Cooper farm.

In Gilmer County, T. M. Cain and others are rigging up on the Harriet Gainer farm in DeKalb district. In this district McCall Drilling Co. is spudding on the G. W. Wigner and others lease.

(Continued on Page 164)

Forest Oil Corporation Begins Series of Tests in Venango County, Penna.

OIL CITY, Pa., Oct. 22.—Forest Oil Corp. of Bradford has leased more than 2,200 acres in and around Cherrytree Township, Venango County, and today began drilling a series of widely scattered tests to determine the probable oil content remaining in these veteran oil producing sands. One string is spudding today, and another string will be added next week to complete the six coring operations which are to guide development plans of the Forest corporation along Oil Creek's broken sand region.

The first well to be cored will be located on the D. M. Marsh farm, 2 miles north of Cherrytree, and midway between Oil City and Titusville. On the ground now are Hazen Rice of Cooperstown, the drilling contractor; Vern Owens, general superintendent; Haven L. Smith, who blocked the acreage for the Forest corporation, and Fred Barber, of the Forest corporation's land department.

Farms included in this large tract are the following: Dorcie Marsh, Dr. Samuel Benninghoff, Martin Benninghoff, Doctor Colvert, Arthur Parker, Mrs. Alice Rheem, John Artley, Frank Bell, Ben C. Wicker, Peter McDonald, Walter Critchlow and Arthur Barker.

Another of the larger Bradford oil producing companies is reported to have leased a large block around Good Will Hill. It has been known for some time that Pittsburgh interests were seeking acreage in Church Run vicinity, near Titusville.

While the Venango County sands encountered in this district have generally been considered unfit for water flood development because of the variations in texture, found in the second and third sands particularly, some encouragement is provided by successful experiments in the Tiona sand near Clarendon, in Warren County, where water flooding has been substituted for air-gas repressuring. The Tiona sand lacks considerably the uniformity of the Bradford and Richburg sands which have proved so prolific in the Bradford-Allegany water drive areas. However, it is possible the newcomers in this field plan air-gas repressuring on the scale which has characterized their northern field activity.

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Among Gulf Coast Drilling Contractors

Charlie Rowan is back in the Houston office of the Rowan Drilling Co. after several weeks spent in recuperating from the effects of an accident in East Texas in which he suffered a broken arm and two broken ribs. He was struck by a piece of 2-inch pipe following the failure of a gate valve. The Rowan Drilling Co. has one rig running in Jal, N. Mex., for the Continental Oil Co.; one running in Upshur County, East Texas, for the Humble Oil & Refining Co.; one in Wood County, near Emery, for the Rio Oil Co.; one in the Cayuga Field for the Tide Water and Texas Seaboard Oil Companies; one for the Amerada Petroleum Corp. in the Tomball Field; and one for the same company in the Stratton Ridge Field, Brazoria County.

The San Patricio Drilling Co. has reached 6,000 feet on its hole for the McCarthy Oil Co. near Danbury, Tex., which is scheduled to go to 6,500 feet.

Rutherford Drilling Co. has completed the second well in the Van Vleck Field for the Skelly Oil Co., bringing it in as the first black oil producer in the field.

Loffland Brothers were successful bidders on a wildcat well for the Stanolind Oil & Gas Co. located on a prospect about 4 miles from Alvin, Brazoria County, Texas. The well will be known as No. 1 J. W. Service and is located in the A.C.H.&B. Survey. Loffland is rigging up on the job now.

L. W. Capps is preparing to drill a second well on the San Felipe Dome, Waller County, following the good showing made by his first well which came in recently through the drill stem before liner and screen could be set. The original well will be completed by running screen in the next few days.

As a result of the showing of L. W. Capps' well on the San Felipe Dome, DeArman Brothers have staked a location and will move their rig, already in the area, to drill No. 1 Smith for themselves. Location is on the Smith 30-acre tract, in the McFarland Survey, 150 feet from the southwest line, and 150 feet from the southeast line.

Cron & Gracey, who recently completed a gas well for the Texas Co. near Fordtran, in Victoria County, will start rigging at once for a second test for the same company, located 1 mile south of the original well. The company is also rigging up on another location for the Texas Co. in the Manvel Field, Brazoria County. In addition to these operations, the company has four rigs running in the Iowa, La., Field, three for the Shell Petroleum Co. and one for the Barnsdall Oil Co.

Turnbull & Irwin have staked another location at Lockridge, Brazoria County, for themselves and others, which will be drilled to the Marginulina around 6,500 feet. The company also has a rig running for the Devonian Oil Co. in Victoria County and is drilling a well in Liberty.

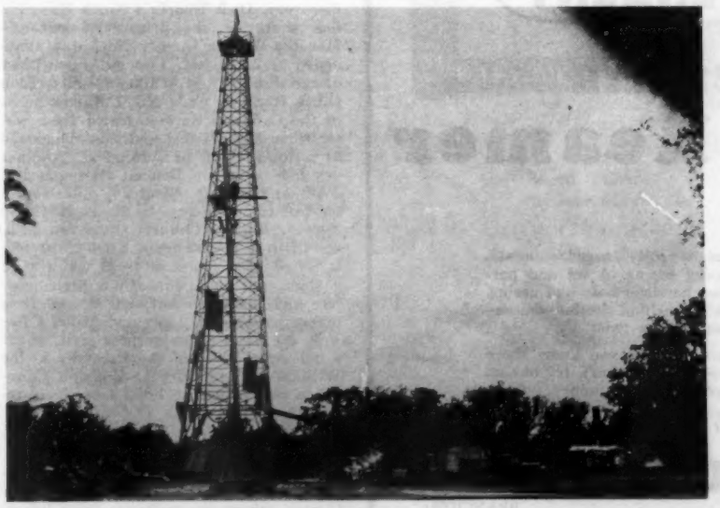
Steen Drilling Co. has finished a well for the Sun Oil Co. in Ector County, has one rig running in the Converse, La., Field on its own properties, and one rig running on a block of acreage owned by the company near Port Lavaca. The latter well is below 5,300 feet.

C. & C. Drilling Co. has sold its drilling locations at Mykawa to the West Production Co., on a deal calling for three wells. The company had spudded on one well prior to closing the deal. C. & C. is clearing timber for a location for the Gem Oil Co. at Livingston, to be drilled at once. The company's rig at East Columbia, which has carried the hole to 4,250 feet, is waiting orders.

C. & R. G. Drilling Co. (Gus Cormier), is waiting for 1,500 feet of surface pipe at Dickinson on a deep test for the Gillock Petroleum Co. On its own well at Alvin, No. 1 Frank Truska the company is drilling ahead at 7,294 feet, having topped the Marginulina at 7,145 feet. Showings are favorable for a strike at or near 7,400 feet, according to geologists and paleontologists.

Alamo Drilling Co. is drilling ahead at 4,700 feet on a deep test at Eureka Heights, Harris County, for C. B. Bunte, Inc., San Antonio. The company has just completed a contract hole at Stratton Ridge for the Amerada Petroleum Corp., which was carried to approximately 6,900 feet. Another rig is running on acreage owned by the company in the Sam Fordyce Field, Hidalgo County.

George Echols has five rigs running at this time, as follows: One for the Sun Oil Co. in Starr County; one for the Humble Oil & Refining Co., Greta Field; one for the Texas Co. on the Sutherland ranch, Duval County; one for the Continental Oil Co. on the Driscoll ranch in Duval County; and one for the Sun Oil Co. in the Bruni Field.



Welder No. 4, being drilled by the Heep Oil Corp., northeast of Sinton, San Patricio County, Texas. Herman Heep, president, is also head of the Conroe Drilling Co. This well is now below 6900 feet. Drill stem test, made at 6614-6661 feet showed 900 feet of oil and mud. Should it come in as a producer, it will open a new area

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Calcasieu Parish Discovery Shows Improvement; Galveston County New Center of Interest

By F. L. SINGLETON
Gulf Coast Bureau, The Oil and Gas Journal

HOUSTON, Tex., Oct. 22.—Union Sulphur Co.'s No. 2 Barbe, 7 miles northeast of Lake Charles, in Calcasieu Parish, Louisiana, which opened a new field last week, showed improvement, and on the last 24-hour gauge made 180 bbls. of net oil through a one-quarter inch tubing choke, with tubing pressure 400 pounds. It is still making salt water, but the quantity is reported to be considerably less than when first brought in. On a shake-out test made from the separator it showed 14 per cent salt water. Total depth is 6,772 feet in sidetracked hole, with the oil sand topped at 6,760 feet.

The well is in what is known as the Gillis area, on a block of 7,000 acres. Three-quarters of a mile northeast of the discovery, in Section 12-9s-8w, the company is drilling below 4,500 feet in sticky shale on its No. 1 State Land. One mile due south of No. 2 Barbe, in Section 13-9s-8w, Fohs Oil Co. is taking bids on the drilling of its No. 1 O. H. Castle in Section 13-9s-8w, which has been a location for some time. The company is reported to have around 1,900 acres south and southeast of the discovery. The operators of the discovery are reported to have paid $4,500 for a four-acre tract south of the discovery, and have agreed to start a test on the M. Buhler estate by December 1. The tract is south of the Calcasieu River.

The Louisiana Gulf Coast has one of the most active wildcatting development programs this district has witnessed in several years. A total of 10 wildcat locations has been made within three months and six of them are active. The majority of the activity is in Calcasieu, Beauregard, Allen and Evangeline Parishes. Humble Oil & Refining Co., Gulf Refining Co. and Texas Co. are the most active major companies, with the lead taken by Humble which made location for another wildcat last week in Evangeline Parish, making a total of four wildcat tests for it in the district. The company is reported to have approximately 750,000 acres scattered throughout the district. In Allen Parish, the company's No. 1 Industrial Lumber Co. is drilling in shale below 7,346 feet. It is on a block of 9,600 acres in Section 21-3s-5w. On the Darrow Dome prospect, Ascension Parish, derrick is up for its No. 2 S. Gumbel & Co. in Section 33-10s-2w. Five miles northeast of Starks, Calcasieu Parish, the company has rig up for No. 1-B Industrial Lumber Co. in Section 27-8s-12w. The latest wildcat location by the company is northwest of Reddell, Evangeline Parish, on the Haas lease, 1,250 feet southeast of Bayou Nezpique and 466 feet northeast of the southwest lines of Section 22-4s-1w.

In Beauregard Parish, Gulf Refining Co. is drilling below 3,762 feet in shale on its No. 1 Lutcher-Moore in Section 25-6s-12w. The company is reported to have around 18,000 acres in this parish owned by the Lutcher-Moore Lumber Co., and has agreed to drill four wells on the acreage. The next block to be tested after it finishes its No. 1 Lutcher-Moore is in Township 8s-12w.

The Texas Co. made location for an interesting test in Cameron Parish, and is moving in material for its No. 1 Jessen in Section 12-14s-10w. This is on a geophysical block of 15,000 acres, 1 mile northwest of Cameron on St. Johns Island, which is formed by the west pass of the Calcasieu River, south of the Calcasieu Lake, and the main stream to Calcasieu Pass.

In Jefferson Davis Parish, George W. Strake of Houston is moving in material for a wildcat on his 5,000-acre geophysical prospect on the Calcasieu National Bank acreage in Section 12-9s-6w. It is 3 miles east of a dry hole drilled by the same operator several months ago and is northeast of the Iowa Field and about 3 miles northwest of the Welsh Field. Another wildcat test announced during the week was H. J. Weir's No. 1 Declouet in St. Martin Parish. Location is in Section 108-8s-5e, and it is drilling below 200 feet in sand.

Kittrell Field

In the Kittrell Field, south Houston County, Texas, Humble Oil & Refining Co.'s No. 1 Shaw, which came in last week for an initial production of 31 bbls. per hour through a one-quarter inch choke, making the second producer in the field, went dead during the week and the operators are now working the hole over in an attempt to bring it back on production. The company's No. 2 Shaw in the Charles McEllis Survey, northwest of the discovery well, is drilling in shale below 1,210 feet. It tested fresh water with a small show of oil on a drill stem test around 1,100 feet. Northeast of the discovery, same operator's No. 1 Texas Long Leaf Lumber Co. was drilled to a total depth of 2,939 feet and plugged back and sidetracked at 1,176 feet, and is drilling in shale below 1,880 feet. Two more dry holes were reported, making a total of six actual dry holes since the discovery. Dick Hooper's No. 1 Mangum, due south of the discovery, near the Houston-Walker County line, was abandoned at 2,127 feet. Two miles southeast of the discovery in Walker County, Lion Oil & Refining Co.'s No. 1 Stokes heirs, in the Callahan Survey, tested fresh water from 2,051-71 feet and was abandoned at a total depth of 2,168 feet. Another dry hole looms in Ben G. Barnett's No. 1 W. A. Reynolds, about 2½ miles southwest of the discovery, in the L. R. Clapp Survey, Walker County. On a four-minute drill stem test from 1,990-2,010 feet it tested 38 fourbles of fresh water with a slight gas show through a three-quarters inch choke on top and bottom. It is preparing to drill. Lacy and Miller's No. 1 J. A. Hanner, an outpost well, about 4 miles northwest of the discovery in the William Dillard Survey, Houston County, is shut down at 1,852 feet. It is reported running low.

Galveston County

Interest on the Gulf Coast is now centered on the Dickinson area, Galveston County, where two wells are due to reach the pay horizon of the discovery well within a day or so. Humble Oil & Refining Co.'s No. 1-B Maco Stewart, one-half mile west and slightly north of the company's No. 1 Maco Stewart, the discovery well, was drilling in shale below 7,825 feet, and is due to pick up the Frio (the pay horizon) by the first of the week. Pure Oil Co.'s No. 1 Shelor, one-half mile north of the discovery in the B.B.B.&C. Survey, was drilling below 7,827 feet in shale and is due to be the first well to pick up the pay. A correlation of the three wells based on the Marginulina gives the following information:

	Elevation	Actual	Subsea
No. 1 Shelor	20	7,036	7,056
No. 1-A Stewart ..	20	7,009	6,989
No. 1-B Stewart ..	20	7,052	7,032

While these two tests are nearing the pay, a third test was getting under way. This is Gillock Petroleum Co.'s No. 2 Maco Stewart, about 870 feet due south of No. 1, which was abandoned, and about 3 miles south of Humble Oil & Refining Co.'s No. 1-B. It is preparing to run casing at 1,500 feet. Location is in the Alex Farmer Survey.

Cleveland Field

In the Cleveland Field, Liberty County, Gulf Production Co.'s No. 6-C Kirby, west of production in the James Eldridge Survey, had a showing of oil from 5,841-47 feet, and on an eight-minute drill stem test from 5,830-47 feet tested 510 feet of oil and 30 feet of mud and salt water through a one-quarter inch choke on bottoms and a three-eighths inch choke on top. It is coring below 5,875 feet in shale. It is running lower than the company's No. 5-C Kirby, completed for a good well last month.

In the same county, but 11 miles north of Liberty in James Robeson Survey, Turnbull and Irwin's No. 1 Lynott and Buffum, an interesting wildcat, was coring in shale below 5,625 feet later in the week. In a core from 5,616-25 feet, it showed considerable gas on the slush pit. On geological markers it is reported to be running about 400 feet high. It showed a heavy gas pressure last week above 4,503 feet, which has stimulated leasing in the area. Arkansas Fuel Oil Co. was reported to have paid $50 per acre cash for the west 45 acres of the east 74.2 acres of the Mrs. Adelia Cessna 104.2-acre tract in the A. B. Hardin Survey, Abstract 46, and $70 per acre cash for a 17.88-acre and an 8-acre tract in the Hugh B. Johnson Survey, south of Turnbull and Irwin's No. 1 Lynott and Buffum. Amerada Petroleum Corp. is reported to have paid $200 per acre cash for the east 52 acres of the M. H. Johnson 498-acre tract in the Hugh B. Johnson Survey, south of the well. Atlantic Royalty Co. paid $200 per acre cash for the south 25 acres of the north 50 acres of Turnbull and Irwin's 100-acre tract out of Lynott and Buffum's 905-acre tract in the James Robeson Survey, which is one-half mile northeast of the well. Fidelity Royalty Co. purchased the Oscar Davis 20-acre tract in the Hugh B. Johnson Survey for $150 per acre cash. Northeast of the well, Atlantic Oil & Producing Co. purchased the west 20 acres of the J. M. Neal 583-acre tract in the James Robeson Survey.

Hardin County

Kirby Petroleum Co. has made location for a wildcat in the extreme northwestern part of Hardin County. It is on the Southwest Settlement & Development Co. lease in the H.&T.C. Survey, Section 226. This is the third test drilled by the operators in this area. The other two tests which were to the north in the James Stephenson Survey, Polk County, were

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abandoned. Actual foot measurements are 1,450 feet west of east line and 330 feet south of the north line of Section 226.

Fort Bend County

Benedum & Trees made a wildcat location in Fort Bend County for a 7,000-foot test, to be drilled northwest from the center of their 5,000-acre block on the Jacob Hensler tract in the Charles D. Sayre Survey. It is northwest of Big Creek and southwest of Rabbs Ridge. The operators' geophysical crew has just finished shooting the area.

Polk County

In Polk County two wildcats were abandoned. Johnston Brothers and others abandoned their No. 1 Smith at a total depth of 4,240 feet in shale, after making drill stem test in the Cockfield, which showed a small amount of oil and gas with considerable salt water. With an elevation of 182 feet it topped the Hockleyensis at 3,010 feet, Operculina at 3,782 feet, and the Cockfield at 3,805 feet. Alpha Petroleum Co.'s No. 1 Martha E. Roberts, in the J. F. DeRumayor Survey, was abandoned at 5,641 feet. It encountered sand showing gas and salt water at 5,065 and 5,119-21 feet. Top of the Dibollensis was 4,916 feet and the Cockfield at 4,993 feet.

In the same county a block consisting between 2,000 and 2,500 acres is being taken just east of the town of Leggett by L. O. Jackson of Livingston.

Sun Oil Co.'s No. 1 Pratt, Livingston Field, Polk County, is shut down awaiting orders after it tested 2 bbls. of distillate in 17 hours through a one-quarter inch choke with tubing pressure 1,050 pounds and casing pressure 1,150 pounds. Location is in the A. Viesca Survey.

Splendora Area

If deals which are pending are consummated, the Splendora area, Montgomery County, is to get another test by Bryce McCandless of Houston who is on a deal to drill a well in the Walker County School Land Survey, to be located about 2 miles southwest of Steen Drilling Co.'s No. 1 Texas Long Leaf Lumber Co. discovery gas well completed several months ago.

Refugio County

In the Bonnie View area, Refugio County, Dale Sneed is reported to have purchased an interest in the J. W. Heard and Holland Oil Co.'s No. 1 Peck that has been shut down for some time at a total depth of 5,348 feet. The test showed a small amount of oil and gas several weeks ago, and it is reported the hole will be deepened. In the same county, Cecil Hagen and O. V. McIntyre have made location for a 5,500-foot wildcat on the Edith Clarkson tract, 1,736 feet from the north line and 3,820 feet from the east line of the J. Coughlin Survey.

Victoria County

In the lower Gulf Coast district of Victoria County, Texas Co. is reported to have made location for its No. 1 Nichols, about 1 mile south of the company's No. 1 Midgett, a gas well which opened a new gas field last week, when completed for a 1,506,000-foot gas well at a total depth of 2,840 feet.

Harris County

West Production Co.'s No. 1 Wilson, Mykawa Field, Harris County, is coring in sand and shale below 5,658 feet. In a core from 5,640-58 feet it recovered brown sand and lignitic shale with an odor of oil. It is reported to be in the Vicksburg. The company has acquired Lots 7, 11 and 12 in the F. J. Rothas Survey from H. C. Akin and have assumed all drilling obligations, which call for a well on each lot.

Waller County

The San Felipe Dome, Waller County, got two new tests during the week as a result of the showing of Seaport Oil Co.'s No. 1 Vaughn, which revived interest in the area last week when it filled a 500-bbl. tank in 4 hours and 10 minutes. The operators of the discovery well are moving in material for their second well, 1,500 feet south of the discovery. It is on the J. W. Avery lease, 330 feet from the east line and 330 feet from the north line of the northeast corner of a 29-acre tract, in the John McFarland Survey. In the same survey, DeArman Brothers have made location for their No. 1 Smith. When the discovery well was opened late in the week after it had been shut down for several days, it is reported to have made considerable oil and then sanded up. At present there is no screen in the hole but preparations are being made to clean the hole and set screen, after which a production test will be made.

Bosco Field

The Bosco Field, Acadia and St. Landry Parishes, South Louisiana, registered one completion during the week, when Superior Oil Producing Co.'s No. 2 Hermandes in Section 34-8s-3e, was completed for an initial production of 410 bbls. in 24 hours with tubing pressure 1,950 pounds and casing pressure 2,500 pounds. It is bottomed at 7,847 feet.

In the Roanoke Field, Jefferson Davis

(Continued on Page 164)

Wildcat Operations on Gulf Coast

Week Ending October 20

RACCOON BEND—AUSTIN COUNTY

Humble O. & R. Co.'s No. 13 Robert Paine, 510 ft. at R/A from NW line and 400 ft. at R/A from NE line of 365-ac. tract, Wm. C. White Sur.
Comp.; T.D. 4,117 ft.; I.P. 76 bbls. per hr.; ½-in. choke.

Humble O. & R. Co.'s No. 6 Alberta Niemar, 625 ft. at R/A from NW line, 337 ft. at R/A from SW line, Wm. Harvey Sur.
Drlg. 2,692 ft.

Humble O. & R. Co.'s No. 10 J. C. Walton, 586 ft. at R/A from NE line, 375 ft. at R/A from SE line and 225 ft. NW of No. 4 Wm. C. White Sur.
Cmtd. surface csg. at 126 ft.; drlg. shale 1,160 ft.

DANBURY—BRAZORIA COUNTY

Shell Pet. Corp.'s No. 7 Blakely-Winston, 63 deg. 11 min. E, 5,540 ft. N, 26 deg. 49 min. W, 300 ft. from SW cor. of Blakely-Winston 560-acre tract, H.T.&B. Sur.
Moving in rig.

Shell Pet. Corp.'s No. 3 Haury, 300 ft. SE of No. 2 in line with No. 2 and No. 1 Blakely-Winston, H.&T.B. Sur. No. 13.
Fishing 6,290 ft.

DAMON MOUND—BRAZORIA COUNTY

Gulf Stream, Inc.'s No. 1 Cave Heirs, 160 ft. from N line and 60 ft. from E line of Lot C, Blk. 50, A. Darst Sur.
Location.

Esco's No. 1-D Wisdom, 25 ft. from S and W lines of Blk. D, Lot 5, A. Darst Sur.
Drlg. shale 1,720 ft.

Intercoastal Oil Co.'s No. 12 Wisdom, 90 ft. from N line and 35 ft. from W line of Lot A, Blk. 51, A. Darst Sur.
Drlg. 2,300 ft.

MANVEL—BRAZORIA COUNTY

Texas Co.'s No. 9-A Belcher, 1,650 ft. S, 42 deg. W, and 330 ft. N, 48 deg. W of E cor. of lease, H. N. Little Sur.
Cmtd. 10-in. csg. at 1,123 ft.; T.D. 1,144 ft.

Texas Co.'s No. 2-A Casolo, 200 ft. N and 200 ft. W of SE cor. of lease, Chas. O'Donnell Sur.
Drlg. shale 5,191 ft.

Texas Co.'s No. 1 Thomas James, 247.5 ft. N and 330 ft. E of SW cor. of Lot 1, A. C.H.&B. Sur. 91, Abst. 402.
Location.

Texas Co.'s No. 2 Scopel, 200 ft. S of N line of lease and 330 ft. SW of SW line of Belcher lease, Charles O'Donnell Sur. No. 74.
Comp.; T.D. 5,150 ft.; I.P. 12 bbls.; ¼-in. choke.

Texas Co.'s No. 4 Houston Oil Field Assn., 247 ft. S of N line and 441 ft. W of SE cor. of Lot No. 10, A.C.H.&B. Sur. No. 91
Comp.; T.D. 3,981 ft.; I.P. 111 bbls. in 15 hrs.; ¼-in. choke.

Texas Co.'s No. 11 Houston Oil Field Association, 441.8 ft. W and 247 ft. N of SE cor. of Lot 9, A.C.H.&B. Sur., 91, Abst. 402.
Derrick.

Gulf Prod. Co.'s No. 4 Calby, 330 ft. out of most northerly NE cor. of 200-ac. tract, Thomas Sproggins Sur.
Rig up.

Gulf Prod. Co.'s No. 3 F. H. Colby, 330 ft. from SE and 330 ft. W from N cor. of Lot 19, SE offset to Windsor Oil Co.'s No. 1 Colby, T. Sproggins Sur.
Comp.; T.D. 5,156 ft.; I.P. 165 bbls.; ¼-in. choke.

(Continued on Page 170)

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THE FIRST NATIONAL BANK and TRUST COMPANY
TULSA

Tom Palmer Drills a 1,759-Barrel Well in Russell County, Kansas; Promises Much Activity

By JAMES McINTYRE

A 1,759-bbl. producer in the new Russell Pool in Russell County, Kansas, was the best well of the week in that State.

Reports from Russell County indicate that that county will be given a lot of consideration by operators this fall and winter, much of it centering around the Russell Pool near the town of that name.

The 1,759-bbl. well above referred to, drilled by Tom Palmer, is a Siliceous lime producer and offsets a good well in the Oswald lime on the Holland farm.

The Federal oil administration gave Kansas a slightly larger allowable in November than in October. This month the allowable is 123,700 bbls. per day, but next month operators in the State may produce an average of 125,000 bbls. per day.

Cowley County

Ben Gralapp and others' No. 1 Barnett, SE SW SW Section 18-32-5, Cowley County, was completed. It pumped 120 bbls. in 24 hours from sand at 2,104-14 feet, which was shot with 100 quarts.

Machine is in for Lassen's No. 1 Ferguson, SE SE SW Section 21-30-8.

Butler County

Penwest Oil Co.'s No. 1-A Steinhoff, SE cor. Section 21-29-6, Butler County, took a potential test and made 125 bbls. in 24 hours from pay at 2,206-17 feet, which had been acidized.

Bill Rex and others' No. 1 DeMoss, NE NE NW Section 8-28-7, Butler County, had sand at 2,665-95 feet, and the hole filled 650 feet with oil. Mississippi lime topped at 2,729 feet was penetrated 2 feet. The sand was shot with 80 quarts and oil rose in the hole 1,700 feet. This is a wildcat test.

T. C. Johnson made a location for No. 2 Stern, SE NE SE Section 28-27-6.

Garden and others' No. 1 Prenner B, NW NW SW Section 32-24-4, had chat from 2,675 to 2,721 feet, total depth. It was acidized and the well pumped 101 bbls. in 20 hours.

Sumner County

Wentz and Continental Oil Co.'s No. 1 Small, NW NW SW Section 5-33-4w, Sumner County, was dry and abandoned at 4,700 feet.

Sedgwick County

In Sedgwick County E. B. Shawver set surface pipe in No. 3 Russell, SW SE SE Section 17-28-1e, and Dickey Oil Co. is building rig for No. 1 Cook, NE SE NW Section 20-28-1e. Dickey Oil Co. has started drilling No. 4 Nolan, SE NE NE Section 20-28-1e.

Magnolia Petroleum Co.'s No. 3 H. Vickers, NW SW NW Section 20-27-2, had chat at 2,949 feet and pay at 2,955-58 feet. It swabbed 52 bbls. of oil in 24 hours.

Solar Oil Co. and Skelly Oil Co.'s No. 17 Wilson, C SE NE Section 1-26-1w, is a 100-bbl. completion at 2,568-78 feet, which had been acidized. Sovereign Oil Co.'s No. 1 Scherger, 250 feet from south line and 1,110 feet from west line of NW Section 6-26-1e, had sand at 2,580-2,602 feet and a 10-bbl. showing. It was acidized with 1,500 gallons.

Paul White, trustee, took a potential test at No. 2-B Gorman, CSL NW NW SW Section 6-26-1e, and the well made 178 bbls. of oil in 24 hours from Kansas City lime. It topped Kansas City lime at 2,555 feet and showings at 2,560-67 feet and at 2,625 feet, total depth 2,700 feet. It had been acidized.

Ted Spencer's No. 1 Underwood, C NW NW NW Section 26-25-1w, had a 5-bbl. showing at 2,675-2,682 feet and was acidized.

Estimated Production

Estimated daily average production of Kansas for the week ending October 20 and for the preceding week follows:

	Barrels	
	Oct. 20	Oct. 13
Hollow	5,950	6,700
Ritz-Canton	10,325	9,565
Voshell	6,200	6,920
Johnson	1,950	1,815
Sedgwick County	7,400	7,350
Nikkell	6,200	5,790
Ellsworth County	3,066	2,970
Barton County	1,216	1,196
Rice County	12,475	11,506
Reno County	7,458	6,260
Ellis County	582	725
Kingman County	1,715	1,645
Stafford County	1,162	1,035
Russell County	8,634	7,350
Greenwood County	11,500	11,750
Butler County	19,200	19,400
Other pools	18,617	18,598
Total	123,650	120,575

Kingman County

Skelly Oil Co.'s No. 1 Kimble, SW NW NE Section 29-27-10w, in Kingman County, was dry and abandoned at 4,236 feet.

Woodson County

Wolf Creek Oil Co.'s No. 1 Lytle, SE NW NW Section 29-25-14, Woodson County, was dry and abandoned at 1,517 feet.

Gore & Markus were drilling at 350 feet in No. 3 Davis, NE SE NE Section 6-24-12, Greenwood County.

Paulhamus and Skelly Oil Co.'s No. 3 Leedy, NE cor. SW Section 25-22-9, Greenwood County, is a 70-bbl. completion following a shot in Bartlesville sand at 2,424-84 feet.

Skelly Oil Co. had cellar dug for No. 28 Wick, C S half SW SW Section 27-22-11.

Henderson & Holman's No. 4 Harlan, C N half NW NW Section 34-22-11, was given a 180-quart shot at 1,870-1,974 feet and is a 50-bbl. completion.

Reno County

In Reno County, Duee & Dustin's No. 1 Evans, C NE NW Section 25-24-8w, deepened from 3,539 to 3,552 feet, had 2,200 feet of fluid in the hole and was given an acid treatment.

Sinclair Prairie Oil Co. had material in for No. 1 Carmichael, CEL W half NE NW Section 15-24-4w.

Shell Petroleum Corp.'s No. 1 Ratzlaff, SE SW SE Section 2-23-4w, was acidized in Hunton lime at 3,607-09 feet. It swabbed 500 bbls. of oil and 125 bbls. of water in 12 hours.

Study, Frost and others' No. 2 White, SW SE SE Section 2-23-4w, was completed. It had Hunton lime at 3,606-16 feet, which was acidized. The well swabbed 1,352 bbls. of oil and 500 bbls. of water in 24 hours and then pumped 1,361 bbls. of oil and 500 bbls. of water in another 24 hours.

Skelly Oil Co.'s No. 1 Sabin, NE NE SW Section 11-23-4w, had Hunton lime at 3,565-3,609 feet. It was acidized and pumped 63 bbls. in one hour.

Barnsdall Oil Co. had cellar dug for No. 3 Sabin C, NE NE SE Section 11-23-4w.

Olson Drilling Co. and Shell Petroleum Corp.'s No. 2 Sabin B, C SW SW Section 13-23-4w, was shot with 20 quarts in Hunton lime at 3,604-21 feet, and made 140 bbls. of oil and 20 bbls. of water in 24 hours. It was then acidized. Same operators had rig up for No. 2 Downie, SW SE NE Section 14-23-4w.

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Wildcat Operations in Kansas

Week Ending October 20

(Descriptions are East unless marked otherwise)

BARBER COUNTY

Lario O. & G. Co.'s No. 1 Whelan, C NW Sec. 32-31-11w.
Chat 4,355-4,435 ft.; P.B. to 4,380 ft.; pumped 231 bbls. oil and 180 bbls. water in 24 hrs.; will retest.

BARTON COUNTY

Gypsy Oil Co. and Atlantic Prod. Co. and Shell Pet. Corp.'s No. 1 Batchman, C SW NE Sec. 18-20-12w.
Siliceous lime 3,433 ft.; T.D. 3,518 ft.; water; S.D. for orders.

Murphin and Downing's No. 1 Lanterman, NW SE Sec. 15-19-11w.
Set 12-in. csg. 515 ft.

National Ref. Co.'s No. 1 Ingersoll, C NW NE Sec. 2-19-13w.
Dry and abd. 3,380 ft.

C. L. Price et al's No. 1 Ehrlich, NW SE Sec. 10-16-13w.
Spudded.

Treleaven & Brimm et al's No. 1 Haas, SW cor. Sec. 30-18-15w.
Building rig.

Walter Shearen et al's No. 1 Kempler, SE NE NE Sec. 31-18-11w.
S.D. 300 ft.

BUTLER COUNTY

Gaines et al's No. 1-A McKinley, NE SE Sec. 19-29-4.
8-in. 1,295 ft.; drlg. 1,415 ft.

Bill Rex et al's No. 1 DeMoss, NE NW Sec. 8-28-7.
Sand 2,665-95 ft.; shot with 80 qts.; 1,700 ft. of oil in hole.

F. H. Unruh et al's No 1-A Joseph, SE SW NW Sec. 18-25-4e.
Rig.

CHASE COUNTY

Strong City Gas Co.'s No. 1 Urschel, NW cor. SE NW Sec. 30-18-8.
500,000 ft. gas 408 ft.

CLAY COUNTY

Seidel Bros.' No. 1 Youkers, C S½ SE NW Sec. 21-9-4.
T.D. 1,252 ft.; C.O.

Severs et al's No. 1 Meyers, NE NW NW Sec. 4-10-4.
Mississippi lime 1,775 ft.; T.D. 1,834 ft.

COWLEY COUNTY

National Refining Co.'s No. 1 Robinson, NE SE NE Section 11-34-4.
T.D. 3,105 ft.; chat 3,084-3,105 ft.; recmtd. 5-in. csg.; C.O.

Otstot et al's No. 1 Eckhardt, SE NW Sec. 15-35-6.
Spudded and S.D.

Wakefield et al's No. 1 Weigle, NW SE SE Sec. 6-32-6.
Sand 2,958-70 ft.; small showing of oil.

DICKINSON COUNTY

Dutch Oil Co.'s No. 1 Phillips, C NE NW Sec. 15-15-1e.
T.D. 2,475 ft.; U.R. 10-in. csg.

ELLSWORTH COUNTY

Ainsworth Bros.' No. 1 Charvat, NE NW NE Sec. 33-15-10w.
U.R. 15-in. csg. to 545 ft.

Lario Oil & Gas Co.'s No. 1 Harbalek, SW NW Sec. 7-16-10w.
Drlg. 2,135 ft.

GREENWOOD COUNTY

Gresley et al's No. 1 Satler, SW SE SW Sec. 28-25-12.
S.D. 335 ft.

(Continued on Next Page)

Corp.'s No. 2 Querfeld, SE cor. Section 27-23-4w, was completed. It pumped 551 bbls. of oil and 50 bbls. of water in a 24-hour potential test, producing from Hunton lime at 3,595-3,609 feet. It was not acidized.

Olson Drilling Co. and Shell Petroleum Corp.'s No. 1 Marr, C NE SW Section 36-23-4w, had a pay at 3,358-61 and 3,364-67 feet, total depth 3,397 feet. It swabbed 20 bbls. of oil and 125 bbls. of water in 12 hours.

Harvey County

The Texas Co.'s No. 1 Androes, SE NW SW Section 8-22-3w, Hollow Pool. Harvey County, deepened from 3,205 feet, found Hunton lime at 3,440 feet. Six-inch pipe was set at 3,442 feet and the hole drilled to 3,480 feet. It stood with 1,200 feet of oil in the hole.

Sinclair Prairie Oil Co.'s No. 6 Martens, NW SW SE Section 19-22-3w, an old well deepened to Wilcox sand at 3,512-43 feet, was completed. It was shot and later pumped 60 bbls. in 24 hours.

The Texas Co. drilled deeper in its No. 1 Androes, SE NW SW Section 8-22-3w. Hunton lime was found at 3,440-80 feet with 6-inch pipe set at 3,442 feet. Oil rose 1,200 feet in the hole.

McPherson County

Continental Oil Co.'s No. 1 Goering, SE SE SW Section 29-21-1w, McPherson County, swabbed 966 bbls. in 19 hours from Hunton lime at 3,279-97 feet.

Roth & Faurot have moved in material for No. 2 Carlson, NW NW NE Section 24-19-3w.

Shell Petroleum Corp.'s No. 2 Hull, CSL SE SE SW Section 11-19-2w, made 313 bbls. in 24 hours in a potential test, producing from Viola lime at 3,362-75 feet. It was completed.

Apex Oil Co. completed No. 5 Knudson, NW NW SE Section 23-19-2w. It made 87 bbls. in 24 hours from chat at 2,923-63 feet which had been acidized.

Helmerich & Payne and Shell Petroleum Corp.'s No. 4 Russell C, NE SW NE Section 23-19-2w, was acidized in Viola lime at 3,373-88 feet and produced an estimated 100 bbls. of oil and salt water.

Lario Oil & Gas Co. was rigging up No. 2 Miller, NW NW SE Section 24-19-2w, an old well 3,407 feet in depth, which will be deepened.

Boyle & Grossman's No. 4 Smith, NW NE NW Section 29-19-1w, pumped 100 bbls. of oil and 175 bbls. of water after an acid treatment in Viola lime at 3,417-29 feet.

Rice and Barton Counties

Stanolind Oil & Gas Co.'s No. 4 Hauser, C SW NW Section 16-20-11w, Barton County, was completed in Siliceous lime at 3,299-3,318 feet. It was acidized but produced only 39 bbls. in a potential test.

Empire Oil & Refining Co. was building rig for No. 8 Hecker, SW cor. Section 18-20-9w, Rice County.

National Refining Co.'s No. 1 Ingersoll, C NW NE Section 2-19-13w, Barton County, had Siliceous lime at 3,348-80 feet but it showed only a little oil and water, and the hole was abandoned.

In Rice County, Empire Oil & Refining Co. was building rig for No. 1 Myers, NW SW SW Section 21-19-9w. E. F. Jones was moving in material for No. 1 Murphy, SW SW SE Section 21-19-9w. Empire Oil & Refining Co. was building rig for No. 1 Grove, SW SW NE Section 29-19-9w. Sinclair Prairie Oil Co. made a location for No. 1 Wallis, NE NE SW Section 29-19-9w.

Keith and others' No. 1 Grove, SE SE NW Section 29-19-9w, an old well, was deepened from 2,985 feet to Siliceous lime at 3,235-41 feet and pumped 729 bbls. of oil in 19 hours. It was not acidized.

C. B. Davis and Gypsy Oil Co.'s No. 3 Christopher, SE NE SE Section 31-19-9w, had Siliceous lime at 3,242-75 feet. It was shot with 250 quarts but the best it did was to fill up the hole with oil to the 1,400-foot level.

Darby Petroleum Co. and others' No.

(Continued on Page 161)

Kansas Wildcats

(Continued from Preceding Page)

HARVEY COUNTY

Imo O. & G. Co. et al's No. 1 Sperling, SE NE NE Sec. 23-22-2.
Spudded.

Wenzel et al's No. 1 Schrag, NW SE Sec. 24-22-3w.
T.D. 587 ft.; S.D. for csg.

KINGMAN COUNTY

W. C. McBride, Inc.'s No. 1 Wolbridge, NW SE Sec. 16-27-7w.
Wilcox sand 4,191 ft.; drlg. 4,205 ft.

McPHERSON COUNTY

C. W. Lamer et al's No. 1 Rolander, NE NE NW Sec. 8-18-2w.
Drlg. 1,135 ft.

Roth-Farout et al's No. 1 Bestwater, SE SW SE Sec. 23-20-1w.
Drlg. 400 ft.

MORRIS COUNTY

Home Gas Co.'s No. 1 Kennedy, C NW SE Sec. 7-16-7.
Sand 650 ft.; 500,000 ft. gas; reblg. rig.

OSAGE COUNTY

Jim Edwards' No. 1 Detrich, C NW SE Sec. 21-14-15.
Spudded.

OSBORNE COUNTY

Carmen & Hershey's No. 1 Fritz, C NE NE Sec. 9-10-14w.
Drlg. 2,395 ft.

RENO COUNTY

Foraker et al's No. 1 Hiett, SE SW NE Sec. 34-24-4w.
Drlg. 135 ft.

McBride et al's No. 1 Popp, SW SW NE Sec. 32-24-4w.
Drlg. 2,755 ft.

Privett Drlg. Co.'s No. 1 Crotts, NE NW NE Sec. 27-26-10w.
Drlg. 1,375 ft. in new hole.

RICE COUNTY

Darby Pet. Co. et al's No. 1 Taylor, NW SE SW Sec. 25-19-8w.
H.F.W. 3,478 ft.; abd.

Deitrick et al's No. 1 Fitzpatrick, C NE NE Sec. 30-21-8w.
H.F.W. 3,736-37 ft.; abd.

Foraker, Nickerson et al's No. 1 Lyon, SE NW Sec. 27-20-8w.
Drlg. 450 ft.

Marathon Oil Co.'s No. 1 Kline, SW SE Sec. 19-14-24w.
Set 10-in. 3,408 ft.; drlg. 3,755 ft.

Robberson et al's No. 1 Johnson, NW NW SW Sec. 22-19-8w.
Old well deepening; T.D. 3,591 ft.; tools stuck; abd.

Stark & Wells' No. 1 Smith, NW cor. Sec 30-19-8w.
Location.

Twin Drlg. Co. et al's No. 1 Rolfs, SW NW SW Sec. 13-17-9w.
Set 15-in. pipe 302 ft.; drlg. 350 ft.

Langston et al's No. 1 Markle, NE SW Sec 1-20-9w.
8-in. 2,943 ft.; drlg. 3,050 ft.

Yingling et al's No. 1 Maupin, NW SW SW Sec. 1-18-8w.
T.D. 2,620 ft.; fishing for tools.

ROOKS COUNTY

Stearns & Streeter's No. 1 Meyers, NE NW NW Sec. 34-9-16w.
Rigged up.

RUSH COUNTY

Corbett, Barbour et al's No. 1 Schmidt, NW SW SE Sec. 10-17-16w.
Drlg. 690 ft.

RUSSELL COUNTY

Blair et al's No. 1 Fink, SW NW SE Sec 16-14-14w.
Rigging up.

Eldorado Ref. Co.'s No. 1 Stratman, SW SE SE Sec. 32-14-11w.
T.D. 2,230 ft.; running 8-in. csg.

Tom Palmer et al's No. 1 Herbel, NW SW Sec. 4-12-11w.
Drlg. 2,185 ft.

SALINE COUNTY

Dieter et al's No. 1 Herrington, NE NW SE Sec. 3-13-1w.
Spudded.

SCOTT COUNTY

Atlantic Oil Prod. Co.'s No. 1 Vaniman, C SE NE Sec. 15-20-33w.
Top K.C. lime 3,945 ft.; set 10-in. 4,014 ft.; rigging up standard tools.

SEDGWICK COUNTY

Aladdin Pet. Co. et al's No. 1 D. Lauck, SE NE NW Sec. 21-28-2.
Rig.

Allison & Fitzwilliams et al's No. 1 Struthers, NE SW Sec. 34-28-2w.
T.D. 1,508 ft.; run 12-in. csg.

Jones, Kirk et al's No. 1 McQuillan, NE NW NE Section 21-29-2w.
Drlg. 3,885 ft.

Leo Keller et al's No. 1 Russell, SW SW NW Sec. 16-29-2.
Cellar.

D. R. Lauck et al's No. 1 Roy, SE SW Sec 24-29-1w.
Drlg. 2,585 ft.

Syndicate O. & G. Co. et al's No. 1 Ratzlaff NE NW NW Sec. 30-26-2.
15-in. pipe set.

SUMNER COUNTY

Wentz and Continental's No. 1 Small, NW SW Sec. 5-33-4w.
Wilcox 4,655 ft.; dry and abd. 4,700 ft.

Wentz et al's No. 1 Horsley, CSL SW SW SW Sec. 18-35-1.
Drlg. 2,798 ft.

TREGO COUNTY

Marathon Oil Co.'s No. 1 Kline, SW SE Sec. 19-14-24w.
Drlg. 4,155 ft.

WASHINGTON COUNTY

Rose Oil Co. et al's No. 1 Penwell, NE NW SE NE Sec. 16-3-3 (O.W.D.D.).
Old T.D. 1,720 ft.; R.U. and S.D.

WOODSON COUNTY

Schwartz et al's No. 1 Collins, SW NW NE Sec. 30-23-14.
Drlg. 610 ft.

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Good Gas Well Completed in Caddo Parish, La.; Several Wildcats Approach Interesting Stage

By J. R. CRUMPTON
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Oct. 22.—North Louisiana and Arkansas districts in this division had a dull and uneventful week, reporting only seven completions and four new operations. A number of important wildcats are drilling but did not reach the testing stage. The division as a whole is humming with more activity than is reflected by the completions and locations staked, and intelligent wildcatting is becoming more apparent each week.

NORTH LOUISIANA

North Louisiana reported three gas wells and one oil well out of five completions. The best well of the week was the United Gas Public Service Co.'s No. 1 Ned Christian, Section 23-23-16, in the Rodessa deep gas field in the northwestern part of Caddo Parish. The initial open flow gauged 77,911,000 feet of highly saturated gas from a total depth of 5,883 feet. Production is coming from sand underlying the Oolitic lime in the upper part of the Trinity, the lime having been the original gas producing horizon in this field. Only recently a well was drilled in this field in search of an oil-bearing sand, but failed to make a commercial producer. The operators discovered, however, that there are a series of gas-bearing sands below the Glen Rose lime, and all wells since that date have been drilled to this depth. One well, finished several years ago in the lime formation making about 1,500,000 feet of gas was deepened to the sand recently and gauged around 60,000,000 feet of highly saturated gas. About two months ago the Arkansas Louisiana Pipe Line Co. extended this field about 2 miles northeast and the formation seems to be checking higher than in the original field. It is reported that the gasoline from the gas in this well is colored, showing an oil content.

Caddo Parish reported two other small gassers, one from the shallow Blanchard Field and one from an old oil-producing district in the Pine Island area. H. E. Philp's No. 1 Surrey, Section 3-20-16, is flowing 1,000,000 feet from the Nacatoch at 984 feet. C. G. Gibbons' No. 2 Burglass, Section 15-21-16, is estimated as a 3,000,000-foot gasser from 2,114 feet.

The only oil well of the week was from the eastern part of the Zwolle Field. The Pelican Natural Gas Co.'s No. 35 Louisiana Long Leaf Lumber Co., Section 9-7-11, is pumping 175 bbls. daily from a total depth of 2,649 feet. The well tested only a small amount of oil and some salt water at 2,490 feet, and was deepened and treated with acid at the total depth. This area of the Zwolle Field also reported the only dry hole in the North Louisiana district. The Texas Co.'s No. 3 R. Maines, Section 5-7-11, was dry and abandoned at 2,800 feet.

Wildcat Has Showing

C. M. Cope and others' No. 1 Thomas, Section 34-13-8, Red River Parish, was the only wildcat testing during the past week. This well encountered a show of oil in the chalk at 1,630 feet, set 7-inch casing at 1,609 feet and bailed with a slight show. The hole was treated with acid and at this writing is bailing to test with a show of oil. Two wildcats in Bienville Parish are being watched closely, one for a possible Blossom sand well and the other as a deeper test than has yet been drilled in that area. The latter, Benedum & Trees' No. 1 J. W. Sprawls, Section 17-15-6, is drilling in hard lime with streaks of slate below the Woodbine at 4,051 feet. The log of the well shows no red beds either above or below the Woodbine, and the operators expect to encounter anhydrites above the Trinity within the next 150 feet. If this should be the case, the Glen Rose or upper Trinity will be contacted about 300 feet higher than expected. This is the first test in that area to be drilled to the Trinity and all operators in the North Louisiana district are watching it with interest. A wildcat drilled a few miles southwest of this test a few years ago to the 4,000-foot level encountered red beds around the 3,600-foot level. In the same parish to the northeast, T. L. James' No. 1 Harrison, Section 2-16-6, has set 12-inch surface casing at 306 feet and is drilling at 790 feet. Two other wildcats are arranging to drill in this parish. Duncan & Fuller have derrick up on their No. 1 J. Hutton, Section 4-18-7, north of the town of Gibsland, and Saline Drilling Co. is arranging to resume on its No. 1 Pardee, Section 27-14-6, near the town of Saline in the southern part of the parish.

Bossier Parish Wildcats

Bossier Parish has several wildcats in widely scattered areas that are interesting. John T. Anderson's No. 1 Leonard, Section 19-19-13, northeast of the town of Shreveport, is drilling in lime at 3,752 feet. L. M. Moffitt, trustee's No. 1 W. H. Martin and others, Section 2-21-12, east of Plain Dealing in the northern part of Bossier Parish, has set 10-inch surface casing at 120 feet and is drilling at 960 feet. This is the third test on a block of 17,000 acres assembled about six months ago in which the Ohio Oil Co., the Magnolia Petroleum Co., and the Triangle Drilling Co., represented by Mr. Moffitt, are interested. The first test was participated in by all of these companies, but the second and present test is being drilled by the Magnolia Petroleum Co. and the Triangle Drilling Co. Other North Louisiana wildcats follow: Bossier Parish: Producers Oil & Gas Co.'s No. 1 W. H. Werner, Section 7-17-11, northeast of the Sligo Field, is arranging to set 4½-inch casing to test a gas show at 3,984 feet. This is either coming from the upper part of the Trinity in the Glen Rose or from the Washita or Fredericksburg between the Woodbine and Trinity. DeSoto Parish: Bayou Pierre Oil Co.'s No. 1 B. Y. Wemple, Section 14-12-11, drilling at 2,336 feet; Century Oil & Drilling Co.'s No. 1 Morton, Section 27-11-14, used acid at 1,620 feet, tested dry and is temporarily shut down; Dempsey-Manziel's No. 1 Thigpen, Section 33-13-13, coring at 1,730 feet; De Soto Petroleum Corp.'s No. 1 Wemple, Section 14-12-11, drilling at 1,410 feet; E. T. Oakes' deep test near Longstreet in the western part of DeSoto Parish has resumed drilling after a good gas show and is coring at 5,424 feet. In Natchitoches Parish, Benedum & Trees' No. 1 Carver estate, Section 6-8-7, has set 15-inch surface casing at 40 feet, 12½-inch at 400 feet, and is drilling at 2,020 feet. This will probably be the deepest test yet drilled in that area. The Red River Refining Co.'s No. 3 Tremont Lumber Co., Section 26-11-1w, Winn Parish, has set 10-inch surface casing at 61 feet and is drilling at 625 feet. This is the third test in this immediate vicinity within the last six months in search of shallow production.

ARKANSAS

This district reported two completions, both dry holes, and one new location staked in wildcat territory. In the Bloomberg area in the southwestern part of Miller County, the Oil Well Oil Corp.'s No. 1 Burt Dood, Section 10-19-28, was dry and abandoned in red shale at 3,810 feet. The test is located a few miles southeast of the area near the town of Bloomberg, East Texas, where a wildcat cored a few feet of likely looking oil sand in the early part of the year. A second test, an offset to the original well failed to contact the sand. In Ouachita Parish, J. S. Carnes' No. 1 D. Scott, Section 18-14-18, encountered salt water and was abandoned at 1,852 feet. The well was originally drilled to 2,052 feet, tested salt water and was plugged back to the abandoned depth.

One new location was staked in this district. The Grand Prairie Realty Co. is rigging up on its No. 1 Fischer, Section 6-6s-4w, in Arkansas County.

Production by Fields

Estimated daily average crude oil production for the week ending October 20, follows:

NORTH LOUISIANA

	Bbls.
Bellevue	420
Caddo, light	4,390
Caddo, heavy	1,625
Converse	1,560
Cotton Valley	505
DeSoto and Red River	1,450
Elm Grove	270
Haynesville	3,750
Holly	165
Homer	2,695
Pleasant Hill	195
Sarepta-Carterville	625
Urania	3,300
Zwolle	2,830
Total	28,880

SOUTH ARKANSAS

Champagnolle	1,100
El Dorado	2,405
Lisbon	355
Miller County	1,500
Nevada	890
Smackover, light	2,315
Smackover, heavy	19,100
Stephens	630
Urbana	2,400
Total	30,695

Wildcat Operations in Louisiana-Arkansas

(Rotary operations unless otherwise designated)

NORTH LOUISIANA

AVOYELLES PARISH

Bell Oil Co.'s No. 1 Woodley, 330 ft. S and W NE cor. NW Sec. 11-2n-5e.
Washing to bottom 1,700 ft.

BIENVILLE PARISH

Benedum & Trees' No. 1 J. W. Sprawls, 660 ft. S, 330 ft. W, NE cor. NW NE Sec. 17-15-6.
Coring 4,051 ft.

T. L. James' No. 1 Harrison, SW cor. NW NW Sec. 2-16-6.
Drlg. 790 ft.

Saline Drlg. Co.'s No. 1 Pardee, Sec. 27-14-6.
Set 10-in. 142 ft.

BOSSIER PARISH

Bossier O. & G. Co.'s No. 1 Sherrill, 300 ft. S and W, NE cor. Sec. 12-9-12.
Junked and abd. 2,261 ft.

Goldman & Sklar's No. 4 Caplis, 1,527 ft. S, 1,452 ft. E, NW cor. Sec. 25-16-12.
Set 10-in. 100 ft.; drlg. 695 ft.

Howard & Baird's No. 1 Gold, 150 ft. S and E, NW cor. Sec. 36-20-13.
S.D. for water 1,126 ft.

McKinney & Stewart's No. 1 Nattin, 470 ft. W, 620 ft. S, NE cor. Sec. 22-22-14.
S.D. 2,972 ft.

L. M. Moffitt, tr.'s No. 1 W. H. Martin, 330 ft. S and E, NW cor. SW NW Sec. 2-21-12.
Set 10-in. 120 ft.; drlg. 960 ft.

Producers O. & G. Co.'s No. 1 Weiner, 660 ft. N and W, SE cor. Sec. 7-17-11.
Arranging to set 4½-in. at 3,984 ft.

United Gas Pub. Ser. Co.'s No. 2 Skannell Unit, 990 ft. N, 660 ft. W, SE cor. Sec. 14-17-12.
Coring 4,070 ft.

United Gas Pub. Service Co.'s No. 1 Herold Unit, 50 ft. S and W, NE cor. SW SE Sec. 13-17-12.
Drlg. 3,707 ft.

CADDO PARISH

Ark.-La.-Tex. O. & G. Co.'s No. 1 Simon, 330 ft. N and E, SW cor. Sec. 15-20-15.
W.O.S.R. 2,226 ft.

W. T. Bell et al's No. 1 Bostick, 1,820 ft. E, 660 ft. N, SW cor. Sec. 12-22-16.
S.D. for water, 2,540 ft.

S. Bendor's No. 1 Starr, 150 ft. N, 195 ft. E, SW cor. SW Sec. 26-20-16.
W.O.S.R. 2,253 ft.

Burkett O. & G. Co.'s No. 1 Lindholm, 400 ft. S and E, NW cor. NE SE Sec. 15-17-14.
S.D. 1,046 ft., repairing rig.

Capitol O. & G. Co.'s No. 1 Noal Est., 300 ft. S and E, NW cor. NE Sec. 12-20-16.
S.D. 450 ft.

O. L. Hickman's No. 1 fee, 1,046 ft. S, 1,700 ft. E, NW cor. Sec. 36-17-15.
Set 10-in. 200 ft.; drlg. 800 ft.

A. D. King, tr.'s No. 1 Roach, 641 ft. E, 375 ft. N, SW cor. SE Sec. 4-14-16.
S.D. 2,128 ft.

H. E. Phillip et al's No. 1 Surrey, 330 ft. S and E, NW cor. NE NE Sec. 3-20-16.
Comp.; est. 1,000,000 ft. gas, 984 ft.

Shreveport Oil Corp.'s No. 1 Muslow, 413 ft. N, 560 ft. E, SW cor. NW Sec. 4-20-15.
W.O.S.R. 2,182 ft.

CALDWELL PARISH

Terrell & Price's No. 1 La. Central Lbr. Co., 300 ft. N, 200 ft. W, SE cor. NW NE Sec. 13-11-3e.
T.A. 3,485 ft.

CATAHOULA PARISH

T. R. Hincy's No. 1 La. Central Lbr. Co., Sec. 32-9-6e.
Set 8-in. 164 ft.

DE SOTO PARISH

L. H. Alderson's No. 1 Peek, SE cor. NW NE Sec. 25-11-13.
S.D. for wtr. 2,030 ft.

Bayou Pierre Oil Co.'s No. 1 B. Y. Wemple, C SE NE SW Sec. 14-12-11.
Drlg. 2,336 ft.

Century O. & Drlg. Co.'s No. 1 Morton, 300 ft. N and E SW cor. SE NE Sec. 27-11-14.
Tested dry; W.O. 1,620 ft.

Jack Clarke's No. 1 Moore, 330 ft. S and W NE cor. NW Sec. 1-13-15.
S.D. 1,675 ft.

W. T. Coleman's No. 1 Rambin Est., 300 ft. S and E, NW cor. SW SE Sec. 13-12-12.
S.D. 50 ft.

Dempsey & Manziel's No. 1 Thigpen, 375 ft. S, 330 ft. W, NE cor. SW NE Sec. 33-13-13.
Coring 1,730 ft.

DeSoto Pet. Co.'s No. 1 B. Y. Wemple, C S½ SE NE SW Sec. 14-12-11.
Drlg. 1,410 ft.

E. L. Foster's No. 1 Youngblood, Sec. 9-11-14.
R.U. to deepen 1,502 ft.

Hester et al's No. 1 Alston, 330 ft. S and W of center of Sec. 11-11-16.
S.D. 2,100 ft.

George Le Grande's No. 1 Vance, 180 ft. N and W SE cor. SW Sec. 34-12-16.
Drlg. 1,110 ft.

W. K. Williams' No. 1 Wemple, 600 ft. N, 330 ft. W, SE cor. Sec. 15-12-11.
Swabbing to test at 2,734 ft.

EAST CARROLL PARISH

Holcomb & Thomason's No. 1 Milliken, 195 ft. N, 1,240 ft. E of C Sec. 22-23-12e.
Set 10-in. at 265 ft.

LA SALLE PARISH

A. D. Hudson et al's No. 1 Urania, 660 ft. W, 150 ft. N, SE cor. NE SW Sec. 7-10-2e.
Set 6-in. at 1,503 ft.

F. A. Trichello's No. 1 Urania, Sec. 3-9-1e.
Rigging up.

MOREHOUSE PARISH

Southern Carbon Co.'s No. 65 fee, 2,030 ft. S, 600 ft. E NW cor. Sec. 14-20-4e.
Set 8-in. at 704 ft.

Zeiger & Bacon's No. 1 Crossett, 400 ft. N, 300 ft. W, SE cor. Sec. 41-23-6e.
T.A. 3,111 ft.

NATCHITOCHES PARISH

Benedum & Trees' No. 1 Carrier Est., 300 ft. N and W, SE cor. Sec. 6-8-7.
Set 15-in. at 40 ft.; set 12½-in. at 400 ft.; drlg. 2,020 ft.

Clyde Crichton's No. 1 Friedman Est., 406 ft. N, 428 ft. E, SW cor. Sec. 52-7-6.
S.D. for wtr., 1,085 ft.

Jack Lent's No. 1 Brown Lbr. Co., 400 ft. S, 300 ft. E, NW cor. NE SW Sec. 27-9-13.
Drlg. 2,600 ft.

Missouri Drlg. Co.'s No. 1 Brown Lbr. Co., 400 ft. N, 330 ft. W, SE cor. Sec. 5-10-10.
S.D. 1,033 ft.

Roy A. Raines et al's No. 1 Raines est., 330 ft. N and E, SW cor. Sec. 8-9-10.
S.D. for water 2,406 ft.

OUACHITA PARISH

Maury Drlg. Co.'s No. 4 Frierson, 660 ft.

(Continued on Page 173)

Opening of Two More Oil Fields in Michigan Reported Virtually Assured During Week

By PAUL A. ELLIOTT
Staff Correspondent, Michigan Fields

MUSKEGON, Mich., Oct. 22.—Opening of two new Michigan oil fields, one in Midland County and one in Isabella County, was virtually assured the past week.

Acid treatment of McClanahan Oil Co.'s No. 1 Maria T. Sweeney, NE NW NE Section 33-15n-3w, Denver Township, Isabella County, one of the wildcats, increased the flow from 250 bbls. a day natural to 80 bbls. an hour when first reopened. Four days later it was reported flowing 20 to 25 bbls. an hour for an estimated 600-bbl. well.

W. Hunter Atha's No. 1 Thomas Moran, C E half SE Section 28-13n-1e, Mount Haley Township, Midland County, flowed 60 to 65 bbls. a day natural when drilled to 3,480 feet after first striking oil and gas in the Dundee pay sands at 3,408 feet. It will be treated.

The McClanahan-Sweeney well is 2 miles east and slightly south of the Leaton Pool, also in Denver Township, Isabella County, in the general direction of the old Chippewa-Isabella County Field. It is a mile south of McClanahan's first wildcat in this section on the Stanley Demski lease.

The Atha-Moran well is 5 miles east of the big Porter Pool.

Midland County

Three new oil producers were completed in the Dundee formation in the Porter and Greendale proved fields of Midland County.

Pure Oil Co.'s south extension test in Porter Township, No. 2 Herman Neitzke, NE NW NW Section 28-13n-1w, made 106 bbls. in 17 hours for an estimated 125-bbl. producer at 3,439 feet. It may be drilled deeper. No. 1 Neitzke, on the same lease, is nearing completion in the Dundee.

McClanahan Oil Co.'s No. 1 C. Hoyt, SW SW SE Section 18, Porter, topped the Dundee at 3,388 feet and drilled to 3,426 feet for an initial of 645 bbls. a day, forcing offsets by Pure Oil Co. to the east and Ohio Producing & Refining Co. to the south. It was the largest new completion of the week.

Pure Oil Co. also completed a new 500-bbl. producer, No. 3-B Mattie Yost, SW SE SE Section 34-14n-2w, Greendale Township, Midland County. It flowed 440 bbls. in 18 hours at a total depth of 3,436 feet.

Seven other wells were more than 3,000 feet deep and nearing completion in the Dundee, in Porter Township, as follows: George G. Hanner's No. 2 Free Methodist Church, C SW NW Section 17; Northern Oil & Gas Co.'s No. 4 Hattie M. Hodge, SW SW SW Section 18; Strange & Fortney's No. 8 J. W. Campbell, NW NE SW, also Section 18; Gordon Oil Co.'s No. 2 Finch Sisters, NW NE NW Section 28, and same company's No. 5 Muscott and others, NW NW NE Section 17; Fred Stork's No. 4 W. C. Breu, SW NE NE Section 20, and Pure Oil Co.'s No. 1 Herman Neitzke, NW NW NW Section 20. James P. McHugh, Trustee's No. 1 Breckenridge State Bank, NW NW NW Section 29, Porter, was still shut down on the Dundee. Nineteen others were drilling, rigring, moving in or spudding in Porter.

One wildcat in Mills Township, Midland County, was shut down while a new test was being started.

Isabella County

Mellon and Pollock's No. 2 Icem C. Slentz, NW SW SW Section 23-16n-4w, Vernon Township, was nearing the Dundee, while W. Hunter Atha's No. 1 Ed Little, NW SW SE Section 31, same township, was expected to drill into the Michigan gas sands this week. One other Vernon test is drilling.

Arbaugh Brothers' No. 1 Ray Aldrich, C NE SE Section 22-14n-6w, Broomfield Township, was nearing the Michigan gas sands with another in the same township drilling. Hal-Be-Oyle & Gas Corp.'s No. 1 O. D. Leiter, SE NE SW Section 33-15n-6w, Sherman Township, was nearing Michigan sand depths with one other test in the same township drilling to the Dundee.

The Wittmer company was drilling two new tests in Sections 12 and 13, respectively, in Isabella Township, 15n-4w, Isabella County, with another building rig in the same township.

McClanahan Oil Co. started building rig on its No. 1 Wonsey, Section 33, Denver, while Pure was moving in for its No. 1-C State of Michigan, NW NE NW, same section. Six others were active in this area. Four other Isabella County projects were active, including two in Rolland Township and on each in Chippewa and Deerfield Townships.

Montcalm County

A small pumper and a dry hole in Home Township and a show in the upper Traverse in a Day Township wildcat were reported in Montcalm County.

Pure Oil Co.'s No. 1 Della Tenney, SE SE SE Section 3-12n-6w, Home Township, is expected to make a small pumper in the upper Traverse after plugging back from a total depth of 3,596 feet (through the Dundee) to 3,117 feet and treating with acid.

Mammoth Petroleum Corp.'s No. 1 Lucy E. Thomas, NW SW SE Section 11, Home Township, after striking a good show of 57 gravity oil in the Dundee at 3,504-11 feet, was drilled into water in the Monroe and will be abandoned.

The Tope-Blunt-Vorhees' No. 1-A Neff Ranch, SW SE NW Section 22-11n-6w, Day Township, topped the Traverse at 2,870 feet, where it struck a show and was shut down. One other was drilling in Home Township, one in Pierson Township and two were uncompleted in Richland Township.

Mecosta County

In Mecosta County 10 new projects are reported located or starting despite one failure in Austin Township. Colmur Oil & Gas Co.'s No. 1 State of Michigan, C NW NE Section 24-14n-9w, Home Township, probably will be abandoned at the red rock after failure in the Michigan sands.

The projects starting up in seven townships include tests in Austin, Hinton, Green, Martiny, Morton, Millbrook and Sheridan, with two new locations in Section 4, in the Austin Township gas field by Taggart Brothers, Inc.

Ogemaw County

A new show in the Dundee in Mill Township, another which had a show in the upper Traverse in the same township, a third which had not yet topped the Dundee although drilled to a greater depth than anticipated necessary and a test which struck water in the upper Traverse in Ogemaw Township, comprised developments in this area 50 miles north of the Porter Pool.

Melling Oil & Gas Co. struck a show in the Dundee and shut down at 2,459 feet to cement casing on top of the Dundee at 2,445 feet before drilling in its No. 1 State of Michigan, SE SE NW Section 6-21n-3e. W. C. Mee's No. 1 Gibbs, SW SE SW Section 30, same township was shut down at 2,614 feet in the Bell shale above the Dundee with formations running low. McClanahan Oil Co.'s No. 1 C. Conard, NW NW NE Section 22, Mills Township, which had a show in the Traverse, continued toward the Dundee. Muskegon Oil Corp.'s No. 1 H. Wilson, NW SE NE Section 24-22n-1e, Ogemaw Township, topped the Traverse at 1,830 feet and struck a hole full of water at 1,850 feet. It was drilling to the Dundee.

McClanahan Oil Co. was nearing the Dundee in its No. 1 F. E. Boutell, SW SW SW Section 5, Ogemaw Township, which failed in the upper Traverse.

Fourteen projects were active in West Branch Township, Ogemaw County, including two nearing the Dundee: Theodore Oil Co.'s No. 3 Ogemaw Country Club, NW SW SE Section 20-22n-2e, and Muskegon Development Co.'s No. 1 Frank Estey, NW NW SW Section 28.

Oceana County

H. C. Nelson of Muskegon reported two of his wells in the Oceana County Field making more than 100 bbls. a day each after treatment last week, No. 3 Anna Copenhaven, NE SE NE Section 36-15n-17w, Hart Township, and No. 2 Myrtle Spittler, SW NW Section 31-15n-16w, Elbridge Township, both near the north edge of the field.

John B. Northcott has not yet spudded his No. 2 Jane Pinder, in Section 31, Elbridge Township, although he has announced he also is considering No. 3 Pinder in the same section and No. 1 Viola Smith in Section 31.

Muskegon County

West Michigan Consumers Co.'s No. 10 Fred Figge heirs, NW SW Section 9-10n-16w, Muskegon Township and County, cased at 2,125 feet just above the Monroe gas sand and is expected to drill into the gas pay sands this week. The company is planning to drill two more Monroe wells in the old Muskegon Field. Two other wells are drilling in the southeast extension of the Muskegon Township Field at less than upper Traverse depth.

Wildcat Developments

Twenty other wildcat and semiwildcat projects are listed in 11 other counties although many were shut down last week. Mellon-Pollock Oil Co. and the Wittmer company's No. 1 Elwyn J. Johnson, SW SE NE Section 1, Richmond Township, Osceola County, was nearing the upper Traverse.

George Henry Flynn Oil & Gas Corp.'s No. 1 Samuel P. Conkling, C SW NW Section 4, Oregon Township, Lapeer County, was reported drilling at more than 1,150 feet. There are five other uncompleted projects in the same township where several small Berea wells are producing.

Two projects are active in Saginaw County with permit for a third taken out.

Ithaca Oil & Gas Co.'s No. 1 Thum, Section 19, Elba Township, Gratiot County, was reported to have encountered water in the Dundee. There are two other uncompleted tests in the county in Bethany and Pine River Townships, the latter just being started by McClanahan

(Continued on Page 164)

Active Week in Central West District; Central Ohio Had 25 Completions

By GEORGE A. WHITNEY
Staff Correspondent, Central West Fields

FINDLAY, Ohio, Oct. 22.—The Central West Field, comprising the Lima, Central Ohio, Indiana, Illinois and Kentucky fields, shows a fairly nice week's work, and there is more activity and many locations that will keep things going far into the fall and winter. In the Lima Field of northwestern Ohio, there remain many good locations to drill and the talk is that during the early spring it will get a fairly good play. The wells may not be as productive as 30 or more years ago but even small producers will be profitable. Jones & Coyle are drilling No. 1 on the Willis Good farm, Section 17, Washington Township, and if it proves a commercial producer, it will bring a play in that county. Two tests are drilling in Marion Township, Henry County, P. D. Snoenby's No. 1 Carrey heirs, Section 6, Marion Township, and No. 1 on the Amelia Badenhop, Section 5, same township, and if they prove productive will add quite a large area for exploration.

In Hardin County, Huffman and others' No. 4 Anna Scharf farm, in Section 18, Pleasants Township, produced an initial of 12 bbls. with a light gas volume, at a total depth of 1,370 feet, and in the Trenton lime formation. Kenova Oil Co. has staked a location for No. 1 on the C. Schinderwolf farm, Section 25, Cessna Township.

In Wyandot County, Plank Oil Co.'s No. 2 Oscar Berg farm, Section 28, Tymochtee Township, produced but 2 bbls. along with a slight gas volume at a total depth of 1,368 feet and in the Trenton lime. Brown and others are spudding No. 3 Edward Horton farm, Section 22, same township, and No. 2 on the same farm, is being drilled by Wood and others in Section 22, Pitt Township. New Oil Co. is shut down at 200 feet in No. 7 on the Minor Koehler farm, Section 20, Crane Township.

CENTRAL OHIO

During the week the Central Ohio Field showed 25 completions, 7 oil wells with an initial of 213 bbls., 13 gas wells and 5 dry holes.

In Ashland County, Gold Crown Oil & Gas Co.'s No. 4 George Horn farm, Section 21, Lake Township, is a gas well at 573 feet, and Robison and others' No. 8 Henry C. Young farm, Section 22, same township, was dry. In Perry Township, Ohio Fuel Gas Co. is drilling No. 1-5,907 C. M. Wise farm, Section 5, and No. 1-5,920 Tully Scott farm, Section 33, same township. In Mohican Township, Moore and others' No. 8 on the George

(Continued on Next Page)

What keeps FIRE out of *your* Tanks?

Photo thru courtesy of Daily Oklahoman and Oklahoma City Times

Good Luck or Good FITTINGS?

FIRE is always a *possibility* and frequently a *probability*—especially from lightning.

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OCECO FITTINGS

Central West Fields

(Continued from Preceding Page)

W. Black farm, Section 34, produced 2 bbls. initial.

In Medina County, D. A. Lake's No. 18 on the Pearl and Frank Weaver farm, in Litchfield Township, was reported dry. In Montville Township, Ohio Fuel Gas Co.'s No. 1-5,867 John W. Selzer farm, Lot 34, is a gas well at 3,485 feet. In Chatham Township, same company is drilling No. 2-5,889 on the Edward C. Herr farm, Lot 12. Same company staked a location for No. 1-5,936 F. T. Kovar farm, Lot 40, Hinckley Township, and has a rig for No. 1-5,918 on the John D. Damley farm, Lot 45, Medina Township. In York Township, Dillon & McFrederick are drilling No. 2 on the James R. Mays farm, Lot 24, York Township. Same company is drilling No. 1-5,842 David E. Pike farm.

In Lorain County, Columbia Township, Ohio Fuel Gas Co.'s No. 1-5,841 A. S. Gibson farm, Lot 80, is a gas well, total depth 2,661 feet. Same company is drilling No. 1-5,895 Addia M. Hoskins farm, Lot 52, Eaton Township. J. W. Cushing is drilling on the James and Anna Lewis farm, Lot 15, Avon Township.

In Holmes County, Ohio Fuel Gas Co.'s No. 1-5,944 Silas Pyers farm, Section 20, Monroe Township, is a gas well at 3,443 feet. Lydic Oil & Gas Co.'s No. 1 Ada Sprang farm, Section 12, same township, is dry at 887 feet.

In Summitt County, East Ohio Gas Co. is drilling No. 4 Everette Beller farm, Section 17, Green Township.

In Knox County, R. H. Bright's No. 30 on the Mary McKee farm, Section 23, Harrison Township, produced an initial of 7 bbls. at 757 feet.

In Coshocton County, Murphy Brothers' No. 2 John S. Rine farm, Section 17, Perry Township, produced 100 bbls. initial at 3,143 feet. Johnson and Byers made a location for No. 1 on the Jacob Bechtel farm, Section 3, Mill Creek Township.

In Licking County, J. G. Long and others' No. 2 Elza J. Fulton farm, Madison Township, produced but 1 bbl. at 694 feet. Blue Rock Oil Co. is drilling No. 7 Walter Hoyt farm, Section 17, Perry Township. C. R. Settles Oil Co.'s No. 2 Oren B. Evans farm, Lot 2, Mary Ann Township, produced 7 bbls. from 585 feet. Everette Gas Co. has a rig for No. 6 Felix Claypool farm, Section 7, Hanover Township.

In Muskingum County, Pure Oil Co.'s No. 6 Lloyd McKee farm, produced 10 bbls. from 3,153 feet. Same company's No. 1 on the Francis M. Norman farm, Section 23, Brush Creek Township, produced 12 bbls. initial at 3,960 feet. Same company has a rig for No. 2 Oscar Mikesell farm, in Jackson Township. Ohio Fuel Gas Co. has a location for No. 2-5,924 on the Howard Tunis farm, Section 19, Muskingum Township.

In Athens County Twenty-Five Associated Co.'s No. 4 W. E. Hentorn farm, Section 17, Berne Township, is a gas well at 1,065 feet. Ohio Fuel Gas Co. is drilling No. 14 Black Diamond Coal Co.'s land, Section 20. Same company has a location for No. 1 on the A. H. Grim farm, Fractional Section 25, Lodi Township.

In Delaware County, Chester L. Wise is drilling on the Herman D. Vance farm, Section 3, Orange Township.

In Tuscarawas County, Glass & Perkins' No. 1 on the James Mascotti farm, Lot 33, Goshen Township, is a gas well at 5,000 feet.

In Stark County, East Ohio Gas Co.'s No. 2 Stewart Bixler farm, Section 9, Plain Township, is a gas well at 4,530 feet. Same company is drilling No. 1 Leo Roush farm, Section 18, same township, and No. 2 is a rig on the Mary Esselbourne farm, Section 4, same township.

In Belmont County, Watson Brothers and others' No. 2 on the A. J. and R. E. Phillips farm, Section 19, Wayne Township, was a dry hole at 1,500 feet. Peters & Patterson's No. 3 on the Lorain Coal & Dock Co.'s property, Section 26, Richland Township, is a gas well at 1,002 feet, and Frank Strange and others' No. 1 James J. Hinkle farm, Section 21, is dry at 1,900 feet.

In Guernsey County, William Preiffer's No. 1 Ankrum & Harding farm, Section 23, Richland Township, was dry at 1,539 feet. In Willis Township, Ohio Fuel Gas Co.'s No. 3-5,912 on the J. L. Lent farm, Section 22, is a gas well at 1,397 feet. R. E. Scott and others' No. 2 on the Roase Peak and others farm is a gas well at 1,338 feet. Ferguson & McCullough's No. 1 on the Francis R. Foraker farm, Section 2, same township, is a gas well.

In Meigs County, Ohio Fuel Gas Co.'s No. 1,519 Cecial Powers farm, Section 4, Rutland Township, is a gas well at 946 feet. Rutland Gas Co.'s No. 3 F. L. McKnight farm, Section 2, same township, is a gas well at 917 feet. In Lebanon Township Joe Rubin and others' No. 1 on the Sophronia Aumiller farm, Section 30, is a gas well at 1,917 feet. Ohio Fuel Gas Co.'s No. 1-5,19 on the H. B. Picket farm, Section 16, Bedford Township, is drilling.

In Lawrence County, R. Schaub is drilling on the Caughlin Hunt farm, Section 35, Windsor Township.

KENTUCKY

In the Kentucky Field 25 completions were reported in the Ohio and Hancock County areas. Eighteen were in Ohio County, there being 5 dry holes, 1 gas well and 12 oil producers with 705 bbls. initial production, while in Hancock County seven wells were brought in with an initial of 180 bbls. two dry holes and one gas well.

In Ohio County, scattered in the various parts of the county, W. E. Hupp and others' No. 2 W. W. Johnson farm, north of Fordsville, was dry. Snowden-McSweeney Co.'s No. 12, G. E. Fuqua farm, in the Roberts Pool, produced 60 bbls. initial. Same company drilled in No. 16 on the J. W. Peckenpaugh farm, in the Matthews Pool, with an initial of 40 bbls. Same company's No. 5 O'Dell heirs farm, produced 40 bbls. initial and No. 6, same farm, produced 24 bbls. Same company brought in a gas well in No. 1 Kate Roberts farm at a depth of 576 feet. Kentucky Natural Gas Co.'s No. 7 C. H. Duggins farm, showed an initial of 45 bbls.

Roberts Pool

In the Roberts Pool, Ohio County, J. C. Miller and others' No. 3 John Whitler farm, produced an initial of 35 bbls. Mark Bell and others' No. 4 Charles Wedding farm, produced 50 bbls. and No. 5, same farm, showed 100 bbls. initial. Stewart & Gealy's No. 1 Richards heirs came in a dry hole. Cumberland Petroleum Co.'s No. 9 Sidney Lancaster farm, same pool, produced 110 bbls. initial.

Oak Station Pool

In the Oak Station Pool, Ohio County, Cumberland Petroleum Co. and others' found a dry hole on the Oak Park Church lot. Richards and others' No. 1 on the Oak Dale School Lot was dry. In the same pool, Vickers and Engle's No. 3 on the Sally Jones 150 acres showed an initial of 150 bbls. The Petroleum Co.'s No. 7 Sally Jones farm produced 50 bbls. the first 24 hours. Mecca Oil Co.'s No. 4 W. J. Smith farm, south of Fordsville, was a dry hole. Cumberland Petroleum Co. and others' No. 10 Rolla Richards farm produced 75 bbls. initial.

Hancock County

Seven completions were made in Hancock County. Joseph B. Mayers' No. 4 on the Grove Pool, produced 50 bbls. and No. 8 same farm, produced 60 bbls. His No. 1 on the Frank Richards 80 acres was a gas well in the Jackson sand at 539 feet and his No. 1 C. F. Spencer farm, Matthews Pool, was dry in the Bethel sand at 636 feet. Sands Petroleum Co.'s No. 3 C. H. Smith farm produced 50 bbls. initial. Younkers-Ealer and others' No. 8 J. H. Smith farm produced 20 bbls. initial. Goldberg and others' No. 2 James Dunn farm, in the Matthews Pool, was dry in the Jet sand.

There were no completions in Indiana and Illinois during the week.

Watson Structure in Southern Alberta Has Four Locations and Two Drilling

By VICTOR LAURISTON
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Oct. 20.—Deliveries of 6,173 bbls. from the Turner Valley Field to the Bell Refining Co. in September brought the total deliveries for that month to 84,041 bbls., Imperial Oil Refineries, Ltd., having previously reported receipts of 77,868 bbls. August deliveries totaled 88,443 bbls., including 82,278 bbls. to Imperial Oil Refineries and 6,165 bbls. to Bell Refining Co. Total deliveries to the two companies up to the end of September were 804,116 bbls., against approximately 500,000 bbls. in the same period last year.

Turner Valley

In the Central Turner Valley Field, New McDougall-Segur Oil Co.'s No. 7, Section 12-20-3w5, has a small show of crude in the upper sands at 3,600 feet and is underreaming to lower 8-inch casing.

On the east side in South Turner Valley, Nolan-Hungerford Royalties' No. 1 Rand, LSD 5, Section 34-18-2w5, is below 2,425 feet and has got the markers at comparatively shallow depth. Merland Oil Co.'s No. 2, LSD 13, Section 27-18-2w5, offsetting No. 1 producer 1,000 feet to the south, has spudded. Northwest Co.'s No. 1 Calgary and Edmonton-Longview, LSD 5, same section, is bailing after a shot in the lime but apparently has not increased production much.

In Section 28-18-2w5, Pacalta Oils' No. 1, LSD 7, is resuming from 5,120 feet, where it got a small gas flow in the top of the lime. It is producing some light crude from the upper horizons. Publix Oil & Gas Co.'s No. 1, LSD 8, has bailed some crude and is redrilling below 4,150 feet to sidetrack old casing. The original hole was at 4,910 feet, a little above the lime. Spooner Oils' No. 5 Anaconda, LSD 1, is in the poker-chip shales below 5,515 feet.

In the same section, British Dominion Oil & Development Corp.'s No. 4, LSD 6, is close to the Blairmore formation below 3,380 feet with traces of light crude. Renfrew Royalties' No. 1 Morris & Goodfellow, LSD 3, same section, is below 2,350 feet and logging closely with Highwood-Sarcee's No. 1 producer to the southeast. Carleton Royalties' No. 1, LSD 2, is below 4,934 feet after encountering a strong gas flow.

Watson Structure

In the southern Alberta foothills, the Watson structure west of Lundbreck is showing the greatest activity, with four locations and two tests drilling. Raven Oils' No. 1, LSD 1, Section 20-9-2w5, is at 1,400 feet. Mar Jon Oil Co.'s No. 3 Prairie, LSD 3, Section 4-10-2w5, is in the Benton shale below 125 feet and having trouble with caving. Erosion has apparently saved about 475 feet in the shale. Mar Jon Oil Co.'s No. 4 Maxmont, LSD 10, Section 20-9-2w5, will probably spud this month. Harry Winger, formerly with the production department of the Iraq Petroleum Co., is in charge. In addition to the acreage set aside for testing by the Maxmont group, the Mar Jon Oil Co. retains approximately 17,000 acres on the Watson structure.

Tests in the Foothills

In the Forest Reserve area west of Olds, Hunter Valley Oil Co.'s No. 1 McLaren, LSD 12, Section 13-31-10w5, is below 4,140 feet.

On the Highwood-Sinclair structure, Canadian Royalties' No. 1 Banner, LSD 6, Section 34-17-3w5, has been put in shape for winter drilling and will resume from 625 feet.

On the Pekisko Hills structure, Pekisko Co.'s No. 1, LSD 6, Section 6-17-2w5, is arranging to resume from 2,315 feet for a complete test of the lower horizons of the Madison limestone. The test, located last December, got the Madison at 1,071 feet and encountered dry gas flows aggregating around 4,000,000 feet, and a trace of crude at 1,738 feet. Between 800 and 900 feet of Madison remain to be drilled.

In the old Oil City Field, Waterton Lakes Park, Oil City Royalties' No. 1 Patrick, Section 30-1-30w4, is below 1,980 feet.

Border Fields

In the Montana end of the Red Coulee Field, Alberta Development Co.'s No. 1 Buckley, SW SW SW Section 1-37n-4w, is pumping around 15 bbls. a day with about 3,000,000 feet of gas from a sand at 2,502 feet. Initial swabbing production was about 100 bbls. a day.

A Canadian group headed by T. P. Kyle of Winnipeg is starting a test on the Bow and Arrow structure west of the Sweetgrass Hills and close to the boundary. Location on the Clark ranch was made by G. G. Howard, Montana geologist.

Operations in Saskatchewan

In southern Saskatchewan, Pine River Petroleums' No. 1, LSD 8, Section 23-12-24w2, on the Dirt Hills structure, 50 miles southwest of Regina, has discontinued drilling at 4,365 feet, about 20 feet in the Devonian lime. It will test a couple of gas shows, the first at about 1,400 feet. The company is a subsidiary of Highwood-Sarcee Oils, Ltd.

At Cummings, near the Alberta-Saskatchewan boundary, Twin Cities Oil Co.'s No. 1 has encountered a show of gas in a horizon apparently corresponding to the Medicine Hat sand.

In the Simpson area, Simpson Oil Co.'s No. 2 has spudded in on a structural high selected as a result of core drill tests. O. L. Etter is president of the company which is financed largely by residents of Simpson.

Kettle Point Deep Test

Fred H. Merritt, mining engineer, of Duluth, Minn., has applied for a permit to drill for oil and gas on the Kettle Point Indian Reserve in Bosanquet Township, Lambton County, Ontario. Location is based on a report by J. S. Stewart, B. Sc. of Ripley, Ontario. Contract has been let to David Wright of Petrolia and standard outfit is being moved in.

Niagara Field

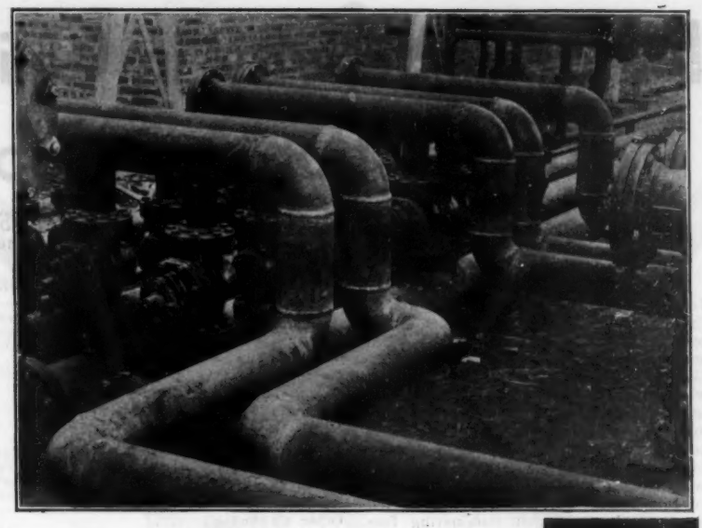
In the Niagara-Haldimand gas area, Domestic Gas Syndicate's No. 4 in Seneca Township, Haldimand County, has blown in with a daily capacity of 100,000 feet. Domestic's No. 5 has been spotted on the Seneca acreage. No. 4 is being connected with the Dominion Natural Gas Co. lines.

Lynn Valley Natural Gas Syndicate has completed a well on its Haldimand County acreage with initial flow of 185,000 feet and is drilling another under a new contract for five additional wells. Norhal Gas & Oil, Ltd., of Hamilton has drilled three wells in Walpole Township, Haldimand County, of which two were good gassers with rock pressure over 500 pounds. Norhal's No. 4 is drilling. Aragain Gold & Natural Gas Syndicate of Toronto is resuming drilling in the Niagara Peninsula. Lowbanks Drillers Gas Syndicate's No. 2, about 2,000 feet east of No. 1 producer, has finished as a fair gasser with 250 pounds rock pressure, and No. 3 is starting. Smith & Ehde are handling the drilling.

Randolph Syndicate is starting systematic development on its acreage in Onondaga Township, Brant County. A. E. Randall & Sons of Petrolia have the contract.

In Beverley Township, Wentworth County, Rockton Oil & Gas Syndicate's No. 1, Mrs. William Burgess farm, on the Galt-Hamilton highway, has encoun-

(Continued on Page 164)



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Drilling Activity in California Increases Potential of State But Allowable May Remain Same

By L. P. STOCKMAN
Staff Correspondent, California Fields

LOS ANGELES, Calif., Oct. 22.—Judging by new wells completed during the month to date and the number of potential producers scheduled to be finished within the next 10 days, it appears that California's potential daily production will be appreciably increased by the central committee when it meets to determine the potential for November. The potential of the State has been gaining consistently since the first of the year but this has had little effect on the allowable production which is predicated on a number of other dominating factors. The permissible for October did not register any great change from the previous month and operators are hoping that the petroleum administrator will follow the same procedure when establishing the allowable for November.

The strenuous attempts of marketers to maintain an equilibrium during the forthcoming winter and effective operation of the Pacific Coast Petroleum Agency require close observance of curtailment on the part of producers as these stabilizing agencies will be unable to accomplish their objective if general price cutting materializes as a result of promiscuous sales of hot crude.

Numerous Completions

Completions were exceptionally numerous during the past week and indications point to another group of new wells within the next 10 days. Drilling operations are holding up in good shape One of the most interesting developments of the present drilling campaign is the fact that operators are not concentrating drilling in one or two fields but are extending their operations to include several fields. Exploration work in potentially productive areas is likewise showing a very substantial gain.

The Mountain View Field of Kern County topped the completion list this week by yielding two exceptionally good wells. The Texas Co. got its first production in this field and celebrated the event by bringing in one of the largest producers finished in the field up to the present time. This was No. 1 Mateo Smith which came in flowing 4,400 bbls. of clean 33.1 gravity oil and approximately 2,600,000 feet of natural gas per day upon completion during the middle of the week. No. 1 Mateo Smith is located in the extreme western end of the Mountain View Field and was drilled from spud to completion in about 60 days without any mechanical trouble of any kind. A second well on the same lease has just passed the 3,500-foot level and should be tanking oil within another 30 days.

The Barnsdall Oil Co. finished an excellent producer on the Morris lease in the eastern end of the field. No. 1 Morris, bottomed at 5,715 feet but plugged back to 5,685 feet previous to completion, was brought in under a natural flow doing 2,240 bbls. of clean 32.4 gravity oil and 1,900,000 feet of natural gas per day. This well is located east of a projected cross fault and is located in close proximity to No. 1 Wharton of the Mohawk Oil Co. and No. 1 Morris of the Shell which were drilled and abandoned several years ago as dry holes. The Barnsdall's geological department deserves a world of credit for this well as it required a lot of courage to step in where two dry holes had already been drilled and then complete a 2,240-bbl. producer. The Union Oil Co. has just started a very important well and the outcome of work will prove rather interesting as the project in question, No. 3 Kernco, will be the most westerly well to be drilled in the field up to the present time.

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	Oct. 7		Sept. 30			
Intercoastal-domestic—	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Fuel oil	68,064	9,723	272,173	38,882	10,500,533	1,150,649
Diesel and gas oil	.....	.....	77,113	11,016	1,098,288	1,200,559
Gasoline	115,918	16,560	.....	.....	5,949,203	8,708,526
Kerosene	.....	.....	.....	.....	798,453	618,966
Asphalt	.....	.....	.....	.....	70,019	13,179
Other finished oil	.....	.....	.....	.....	54,778	75,318
Other unfinished oil	.....	.....	.....	.....	.....	72,584
Foreign exports—						
Crude oil	169,741	24,249	129,626	18,518	6,164,566	5,748,620
Fuel oil	245,257	35,037	205,731	29,390	9,957,630	6,333,292
Diesel and gas oil	136,317	19,474	92,544	13,221	3,192,434	2,501,483
Gasoline	79,960	11,423	84,517	12,074	3,357,746	4,460,002
Kerosene	.....	.....	14,945	2,135	1,358,947	1,564,965
Other finished oil	.....	.....	.....	.....	37,955	12,086
Other unfinished oil	3,070	439	10,705	1,529	224,275	66,375
Coastwise-domestic—						
Crude oil	223,167	31,881	62,590	8,941	6,453,599	5,627,398
Fuel oil	252,227	36,032	74,106	10,587	7,405,999	7,910,466
Diesel and gas oil	11,428	1,633	11,759	1,680	564,487	889,570
Gasoline	160,110	22,873	229,814	32,831	9,839,560	9,949,769
Kerosene	.....	.....	4,738	677	116,246	153,320
Naphtha distillate	.....	.....	.....	.....	.....	27,651

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Fuel oil	.....	.....	.....	.....	110,650	.....
Diesel and gas oil	.....	.....	.....	.....	526,288	511,897
Gasoline	.....	.....	.....	.....	290,325	804,548
Kerosene	.....	.....	.....	.....	276,412	482,430
Lubricants	.....	.....	.....	.....	34,695	33,934
Foreign exports—						
Crude oil	70,160	10,023	.....	.....	1,562,861	1,542,286
Fuel oil	41,665	5,952	.....	.....	1,622,872	1,384,811
Diesel and gas oil	62,098	8,871	.....	.....	1,147,948	835,257
Gasoline	.....	.....	.....	.....	2,411,704	3,279,816
Kerosene	.....	.....	87,092	12,442	876,266	841,225
Lubricants	.....	.....	.....	.....	143,157	101,472
Other finished oil	.....	.....	.....	.....	2,760	3,745
Other unfinished oil	.....	.....	.....	.....	5,750	26,278
Coastwise-domestic—						
Fuel oil	32,960	4,709	47,342	6,763	4,327,722	2,874,900
Diesel and gas oil	.....	.....	.....	.....	119,036	189,322
Gasoline	176,736	24,391	142,893	20,413	4,212,961	3,328,427
Kerosene	5,831	833	.....	.....	70,636	95,204

Edison

The Edison Field, located a few miles east of Mountain View, came back with a bang this week by showing a 2,215-bbl. completion. This large well has tended to revive interest in the field following the abandonment of several tests which ran into the basement complex and consequently failed to show production. The new well chalked up this week was the Edison Oil Co.'s No. 1 Fairchild, located on a 40-acre lease in Section 15-30-29. It showed an initial daily production of 2,215 bbls. of exceptionally clean 30.1 gravity oil and seems to be holding up in good shape. This well was bottomed at 3,637 feet and has an 8⅝-inch water string landed and cemented at 3,252 feet. It is by far the best well finished in the Edison Field up to date as many of the other previous completions have failed to hold up for any length of time following completion.

Over in the Mount Poso Field, the Union Oil Co. successfully completed No. 12 S. & M., which was brought in pumping 741 bbls. of clean 16.4 gravity oil per day from 1,803 feet. After finishing this well, the Union spudded in No. 16 S. & M. and started building rigs for Nos. 17, 18, 19, and 20. The Shell has just completed two new wells in this field but they have not yet been given production tests. They should be on production within the next few days, however, and can be expected to register commercial production. Like the Union, the Shell is taking steps to start several new projects in the immediate future.

Kettleman Hills

The Union Oil Co. chalked up an excellent completion in the Kettleman North Dome Field a few days ago and this new producer was brought in flowing 9,235 bbls. of clean 35.6 gravity oil and 18,400,000 feet of natural gas per day. The Union's new well was No. 7 King which was bottomed at 8,640 feet and is flowing under a casing pressure of 1,280 pounds. The Union has one more well to drill on the King lease, which consists of 160 acres, and it is quite likely that No. 8 will be spudded in the very near future. The company is deepening No. 6 King which was completed a few months ago in the upper part of the Temblor as an experimental well to determine just how much this portion of the zone would be good for when the time came to plug back.

The Union is having a lot of trouble with No. 1 Lillis-Welsh which it took over from the North Kettleman Oil & Gas Co. about a year ago and it is doubtful whether this hole can ever be cleaned out sufficiently to permit a resumption of drilling. The Union is anxious to make a conclusive test of this property if possible as it holds several hundred acres under lease on adjacent property which would prove quite valuable if the field could be extended. In addition to several new wells being started by Kenda and the Standard Oil Co., the Associated is rigging up rotary drilling equipment preparatory to an early spud in No. 5 Whepley and the Petroleum Securities is building rig for No. 4 Felix which should get under way shortly.

Dominguez

The Union Oil Co. successfully completed No. 6 Carson in the Dominguez Field of Los Angeles Basin this week and this well was brought in flowing 410 bbls. of 31.7 gravity oil per day on a gas lift. This well was bottomed at 6,603 feet and finished with a 6⅝-inch water string landed and cemented at 6,410 feet. No. 6 Carson was completed in the Miocene and while it showed commercial production it did not exactly come up to expectations. In the Brea Olinda Field, the General Petroleum has beaned back No. 8-A Tonner and is making preparations to spud in No. 15 on the same lease. At West Coyote, the Standard is building new rig for No. 120 Murphy Coyote and should complete No. 116 on the same lease within the next 10 days as the bit is going ahead in the pay at 6,060 feet.

Three wells were put on production in the Long Beach Field this week and two of them registered satisfactory production. These were the Olmstead Petro-

California Natural Gasoline Association Announces Program of Fall Meeting

Signalizing eight years of successful co-operative activity, the California Natural Gasoline Association will hold a one-day fall meeting at the Los Angeles Biltmore Hotel on Thursday, November 1, beginning at 9 o'clock in the morning.

The morning session, under the direction of P. S. Magruder, will consider reports from various committee chairmen covering the association's co-operative technical studies on problems affecting the natural gasoline industry. Arranged in a novel and interesting manner, the session will reveal the history, present status and future plans for such problems as:

Gas Deviations from Boyle's Law.
Vapor Pressure of Absorption Oils.
New Developments in Charcoal Test Procedure.
Progress in the Standardization of Correct Methods of Gas Measurement.
Preparations for the Developments of a Table of Physical Constants for Natural Gas Hydrocarbons.
Development of a Procedure for Correctly Gauging Tank Trucks.
A.S.T.M. Natural Gasoline Distillation Procedure.
Reid Vapor Pressure Test.
Specific Gravity Determinations.

At the afternoon session Dr. W. W. Lacey, professor of chemical engineering at the California Institute of Technology, will be the principal speaker and will deliver a paper on the subject, "Properties of Propane." This presentation will be of great interest to natural gasoline men, refiners, research and liquefied petroleum gas engineers, plant operators and chemists. Based upon experimental findings on work done for the A.P.I., the paper will reveal a wealth of information which those engaged in gas work have long wished was available for practical use. Doctor Lacey intends to explain his findings in a manner which will show the various steps to be taken in attempting to apply propane data in a practical way to plant and engineering problems.

Supplementing Doctor Lacey's paper will be a series of short papers by E. R. Cox, E. G. Ragatz, W. L. Rifenberick, N. N. Wade, Frank West and others, bringing out the practical application of propane and related data to the solving of natural gasoline, liquefied petroleum gas and vapor recovery plant problems.

The evening session will be given over to a banquet at 6:30 o'clck, followed by entertainment.

leum's No. 1 McKenzie, a new well brought in doing 402 bbls. of 29.4 gravity oil and 244,000 feet of natural gas per day and the Texas Co.'s No. 4 Robinson which was plugged back from 7,168 feet to 5,094 feet and returned to production pumping 494 bbls. of clean 26.6 gravity oil per day. The Olmstead Petroleum's new well was bottomed at 4,570 feet and finished with a 4¾-inch liner including 80 feet of perforated. George F. Getty, Inc., recompleted No. 5 McLaughlin pumping 144 bbls. of 23.7 gravity oil per day after redrilling and deepening the hole to 4,250 feet but the output is still cutting about 10 per cent. Oscar Dye is erecting a new rig for his No. 3 over the Marine Oil Co.'s No. 8 which was abandoned several years ago and he should be able to re-enter the hole within the next 10 days.

Santa Barbara Mesa

Two new wells were finished in the Santa Barbara Mesa Field this week although only one of them showed substantial production. This was William Hughes' No. 1 Hicks which was brought in under a natural flow doing 1,820 bbls. of clean 22.2 gravity oil per day from 2,050 feet. The Allied Petroleum's No. 14 Mesa, finished at 2,085 feet, was only good for 230 bbls. per day. Several new wells are being started in this field and officials of the Rio Grande Oil Co. have announced that they have acquired the 40-acre Perkins lease and will proceed to drill a new well as soon as equipment can be moved in.

The Shell Oil Co. added a new well to its list of producers in the Capitan Field of Santa Barbara early this week when No. 1-3 Covarrubias was finishing flowing 931 bbls. of clean 43.1 gravity oil per day, at 2,320 feet in the Sespe and finished with a 4¾-inch liner including 110 feet of perforated and 2,142 feet of 2½-inch tubing.

Huntington Beach

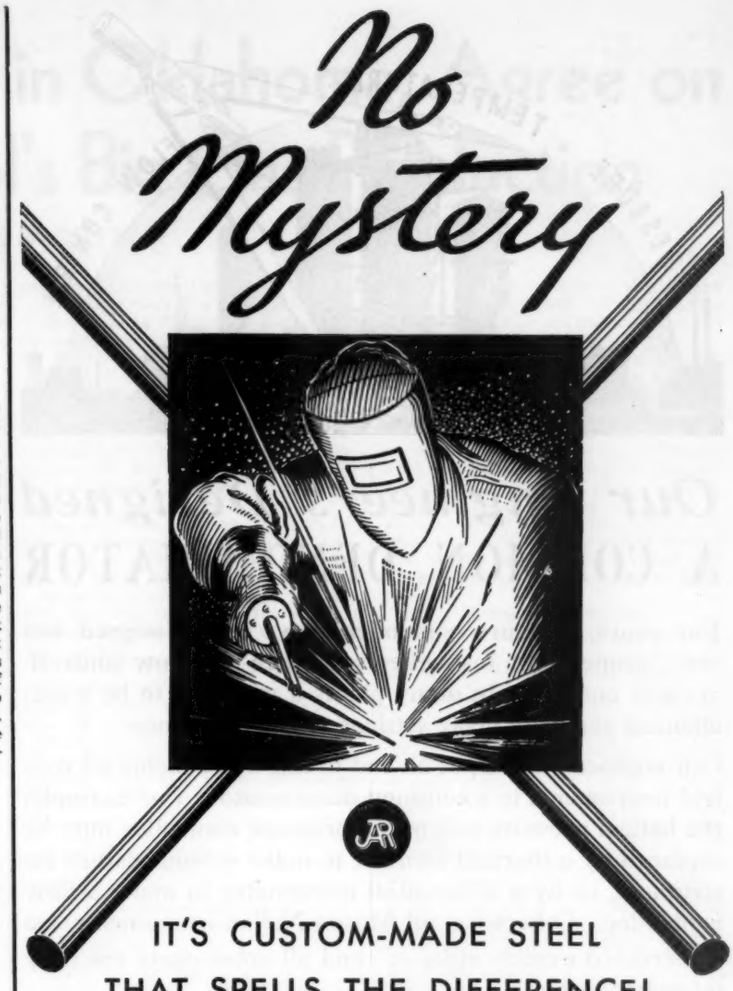
The Standard Oil Co. should have two new wells ready for production tests in the Huntington Beach Field of Los Angeles Basin within the next 15 days and it appears quite probable that the West American Oil Co. may also add a new well to its list of producers along about that time. Drilling operations have declined to such an extent in this field that there is very little activity under way at the present time.

Montebello

Another few weeks should determine the future status of the Montebello Field as far as the deep Cruz zone is concerned and the outlook at present is far from promising. This horizon has failed to come up to expectations and unless something unforeseen changes the picture deep zone exploration will be suspended for an indefinite period. Deep drilling in this field presents one of the strangest problems that has confronted operators in a long time. Everything seems to be haywire and despite the drilling of about 10 wells no one seems to know what it is all about. Contours run backwards as compared with productive contours of the upper zone and there is absolutely no uniformity with respect to structure. Most operators seem to agree that the Universal Consolidated apparently en-

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S. T. R.	Depth	Status—
General Pet. Co., No. 11 Capitan, Santa Barbara Co.	32- 5-30	2,261	rd. sh. drlg.
Shell Oil Co., No. 3 Capitan, Santa Barbara Co.	32- 5-30	2,320	600 b. d.
Royalty Ser. Corp., No. 1 Los Alamos, Santa Barbara Co.	35- 9-32	3,275	hd. sh. drlg.
Union, No. 2 Santa Maria, Santa Barbara Co.	24-10-34	2,389	cleaning out
Union, No. 3 Santa Maria, Santa Barbara Co.	35-10-34	....	location
Signal Oil & Gas Co., No. 1 Elwood, Santa Barbara Co.	tideland	3,197	hd. sh. drlg.
Barnsdall-Rio Grande, No. 8 Doty Elwood, Santa Barb. Co.	15- 4-29	5,732	redrlg. 1,225
East Elwood Pet. Co., No. 1 Elwood, Santa Barbara Co.	14- 4-29	3,512	suspended
Shell Oil Co., No. 1 Goleta, Santa Barbara Co.	20- 4-28	4,259	cmtd.
Standard Oil Co., No. 2 Goleta, Santa Barbara Co.	17- 4-28	4,850	redrlg. 3,400
Ortega Oil Co., No. 1 Summerland, Santa Barbara Co.	16- 4-26	3,900	rd. sh. drlg.
Woodrow Pet., No. 1 Rincon, Ventura Co.	4- 3-24	7,612	redrlg. 6,020
Continental, No. 3 San Miguelito, Ventura Co.	23- 3-24	7,015	fish. d. c. & b.
Las Posas Pet., No. 1 Las Posas, Ventura Co.	22- 3-20	7,370	resume work
Texas Co., No. 128 South Mountain, Ventura Co.	4- 3-19	4,112	rd. sh. drlg.
Oil Ridge Oil Co., No. 1 Fillmore, Ventura Co.	1- 4-19	1,253	bailed dry
Bolsa Chica Oil Co., No. 2 Piru, Ventura Co.	4- 4-18	418	sd. sh. drlg.
Piru Oil Co., No. 1 Piru, Ventura Co.	14- 4-18	1,200	suspended
American Drlg. Co., No. 1 Simi, Ventura Co.	6- 2-17	903	cmtd., idle
Dawson Oil Co., No. 1 Simi, Ventura Co.	5- 2-17	1,549	sd. sh. drlg.
Rancho Oil, Inc., No. 1 Ojai, Ventura Co.	18- 4-23	2,035	sd. sh. drlg.
Continental, No. 1 Ojai, Ventura Co.	12- 4-23	rig	rigging up
Prop. Service Corp., No. 1 Lloyd, Ventura Co.	24- 3-23	6,928	cmtd. 6,850
Kirk, W. A., No. 1 Sulphur Mountain, Ventura Co.	21- 4-22	2,400	P.B. 2,370
Mosher, J. W., No. 1 Santa Paula, Ventura Co.	22- 4-21	2,300	reaming 1,965
Standard Oil Co., No. 1 McKittrick, Kern Co.	15-30-22	4,995	gr. sh. drlg.
Casa Mira Oil Co., No. 1 Belridge, Kern Co.	29-28-20	6,197	hd. sh. drlg.
General Pet., No. 1 South Belridge, Kern Co.	30-28-21	11,377	suspended
Union Oil Co., No. 18 North Belridge, Kern Co.	36-27-20	8,523	cleaning out
Standard Oil Co., No. 1-A North Belridge, Kern Co.	36-27-20	2,793	sd. sh. drlg.
Amerada Pet., No. 1 Blackwells Corner, Kern Co.	17-26-19	2,723	wet, plug 2,641
Home Corp., No. 1 McFarland, Kern Co.	16-26-27	2,102	suspended
Ohio Oil Co., No. 1 McVan, Kern Co.	22-27-27	1,364	cleaning out
Pell Oil Co., No. 1 McVan, Kern Co.	14-27-27	188	sd. drlg.
Buckeye Union Oil Co., No. 1 McVan, Kern Co.	11-27-27	rig	rigging up
Hancock Oil Co., No. 1 Mountain View, Kern Co.	14-30-28	1,122	sd. sh. drlg.
Associated Oil Co., No. 1 Mountain View, Kern Co.	3-31-29	101	sd. drlg.
Associated Oil Co., No. 2 Mountain View, Kern Co.	14-30-28	173	sd. drlg.
Union Oil Co., No. 3 Mountain View, Kern Co.	15-30-28	2,194	sd. sh. drlg.
Texas Co., No. 1 Mountain View, Kern Co.	14-30-28	5,540	3,750 b. d.
Barnsdall, No. 3 Mountain View, Kern Co.	32-30-29	5,685	1,900 b. d.
Hogan Pet., No. 5 Mountain View, Kern Co.	32-30-29	6,287	recmtd. 6,191
Standard Oil Co., No. 3 Mountain View, Kern Co.	23-30-28	5,449	recmtd. 5,408
National Oil Co., No. 1 Mountain View, Kern Co.	30-30-29	5,604	redrlg.
Gilco, Inc., No. 2 Edison, Kern Co.	23-30-29	1,605	sd. sh. drlg.
Jergins Trust Co., No. 1 Edison, Kern Co.	22-30-29	3,894	Schist, acd.
Jergins Trust, No. 2 Edison, Kern Co.	14-30-29	2,704	Schist, abd.
Jergins Trust, No. 3 Edison, Kern Co.	14-30-29	rig	suspended
Jergins Trust, No. 4 Edison, Kern Co.	24-30-29	....	location
Shell Oil Co., No. 1 Edison, Kern Co.	16-30-29	4,276	plug back
Edison Oil Co., No. 1 Edison, Kern Co.	15-30-29	3,637	2,000 b. d.
Centralia Oil Co., No. 1 Edison, Kern Co.	26-30-29	2,317	abd.
North American, No. 1 Edison, Kern Co.	14-30-29	mtl.	bldg. rig
General Pet., No. 1 Edison, Kern Co.	14-30-29	rig	rigging up
General Pet., No. 2 Edison, Kern Co.	15-30-29	rig	rigging up
Lee Oil Co., No. 1 Edison, Kern Co.	6-30-29	3,472	hd. sd. drlg.
Tejon Ridge Oil Co., No. 1 Comanche, Kern Co.	23-32-29	1,250	suspended
Standard Oil Co., No. 1 Semi-Tropic, Kern Co.	8-27-23	mtl.	bldg. rig
101 Oil Co., No. 1 Elk Hills, Kern Co.	5-30-24	rig	rigging up
Texas Co., No. 1 Tembler, Kern Co.	29-29-21	....	location
Badger Oil Co., No. 1 Wheeler Ridge, Kern Co.	31-11-19	6,285	sd. sh. drlg.
Russ Oil Synd., No. 1 Kingsburg, Fresno Co.	28-12-11	4,438	cleaning out
Bergman, Harry, No. 1 Kingsburg, Fresno Co.	12-12-11	6,138	suspended
Union Oil Co., No. 1 Lillis-Kettleman, Fresno Co.	24-21-16	10,944	sidetrack D.P.
Texas Co., No. 1 Coalinga, Fresno Co.	35-20-14	....	material
Western Gulf, No. 2 S.P., Fresno Co.	11-17-15	6,525	reaming
Farrel Pet., well No. 1, San Luis Obispo Co.	18-31-12	1,256	hd. sh. drlg.
Willett Oil Co., No. 2 Cholame, San Luis Obispo Co.	10-25-15	2,202	suspended
Commonwealth Consd. Gas Co., No. 1 Tulare Lake, Kings Co.	21-22-20	2,490	suspended
Commonwealth Consd. Gas Co., No. 3 Tulare Lake, Kings Co.	21-22-20	rig	rigging up
Kettleman Pac. Oil Co., No. 1 Tulare Lake, Kings Co.	11-23-16	812	sd. sh. drlg.
Trico Oil & Gas Co., No. 1 Alpaugh, Kings Co.	33-24-22	3,712	suspended
Trico Oil & Gas Co., No. 2 Alpaugh, Kings Co.	3-25-23	2,478	4,000 mcf gas
Buttes Oilfields Co., No. 2 Marysville, Sutter Co.	15-16- 1	5,615	hd. sh. drlg.
Milham Exploration Co., No. 3 Tracy, San Joaquin Co.	24- 2- 4	1,318	sd. sh. drlg.
Pure Oil Co., No. 1 Chowchilla, Madera Co.	7-10-14	5,231	sd. sh. drlg.
Northern Counties Pet., No. 1 Tehama, Tehama Co.	25-24- 3	1,812	hd. sh. drlg.



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countered a stray sand that seemed to indicate a possibility of developing a deeper zone in the Montebello Field but which failed to prove of any consequence.

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S. T. R.	Depth	Status—
Clayton, G. L., No. 1 Cerritos, Los Angeles Co.	31- 3-13	6,698	fishing D.P.
Kelly & Son, No. 1 Torrance, Los Angeles Co.	7- 4-13	6,433	redrlg. 5,650
Houser, G. W., No. 1 Athens, Los Angeles Co.	18- 3-14	4,037	cleaning out
Wilshire Oil Co., No. 2 Potrero Deep, Los Angeles Co.	27- 2-14	7,985	fishing D.P.
Fourl, C. W., No. 1 Del Rey, Los Angeles Co.	27- 2-15	6,196	sd. sh. drlg.
Big Ben Oil Co., No. 1 Del Rey, Los Angeles Co.	27- 2-15	....	material
Staple Oil Co., No. 1 Manhattan, Los Angeles Co.	24- 3-15	4,385	br. sh. drlg.
Standard Oil Co., No. 1 Montebello Deep, Los Angeles Co.	6- 2-11	7,996	gr. sd. drlg.
St. Helens, No. 1 Montebello Deep, Los Angeles Co.	6- 2-11	7,038	rig pump
Shively, N. O., No. 1 Puente Hills, Los Angeles Co.	23- 2-10	rig	rigging up
Deep Rock Oil Co., No. 1 Puente Hills, Los Angeles Co.	23- 2-10	2,540	resume work
Pressel & Till, No. 1 Puente Hills, Los Angeles Co.	30- 2- 9	3,741	br. sh. drlg.
Barstow Oil Co., No. 2 Saugus, Los Angeles Co.	35- 5-16	2,400	suspended
International Dev. Co., No. 1 Saugus, Los Angeles Co.	34- 5-16	3,358	testing
Black Eagle Oil Co., No. 1 Huntington, Orange Co.	tideland	4,021	suspended
Explorers Drilling Co., No. 1 Fairview, Orange Co.	9- 6-10	945	plug 438, idle
Nuoli Co., No. 1 Newport, Orange Co.	29- 6-10	6,485	rigging up
B. & B. Oil Co., No. 1 Newport, Orange Co.	19- 6-10	rig	rigging up
Platt & Collins, No. 1 Costa Mesa, Orange Co.	14- 6-10	2,566	suspended
Mid-Rich Drlg. Co., No. 1 Atwood, Orange Co.	26- 3- 9	4,019	suspended
Bridger, J., No. 1 Coyote, Orange Co.	15- 3-10	5,410	suspended
Great American Pet. Co., No. 2 East Coyote, Orange Co.	19- 3- 9	1,010	sd. sh. drlg.
Great American Pet., No. 1 Chino, San Bernardino Co.	18- 2- 8	2,462	suspended
Great American Pet., No. 2 Chino, San Bernardino Co.	18- 2- 8	3,152	suspended
Great American Pet., No. 3 Chino, San Bernardino Co.	7- 2- 8	200	suspended
Tehama Pet. No. 1 Santa Ana Canyon, San Bernardino Co.	33- 2- 8	2,720	plug 2,680
San Diego Pet. Co., No. 1 Chula Vista, San Diego Co.	32-18- 2	5,465	rd. sh. drlg.
Edmonds, E. A., No. 1 Trustee, San Diego Co.	29-15- 3	2,042	sd. sh. drlg.
Everts Drlg. Co., No. 1 Camp Kearney, San Diego Co.	23-15- 2	600	sd. sh. drlg.
Great Coastal Oil Co., No. 1 Elsinore,, Riverside Co.	36- 5- 5	rig	suspended

Gas Field Developments in New York and Pennsylvania

WELLSBORO, Pa., Oct. 22.—Gas field operations in north central Pennsylvania during the week were routine, the one completion being dry and abandoned. In south central New York five completions included one good gasser. One mile north of Camden, N. Y., a shallow gas well was drilled to the Trenton at 1,100 feet and came in for 1,700,000 feet. This well blew down rapidly, however.

Wittmer Oil & Gas Co. completed its Terrence-O'Horrigan well at 4,727 feet for an estimated daily production of 7,000,000 feet, in Greenwood Township, Steuben County. Top of sand was reached at 4,538 feet. Another deep test in the New York Field proved a failure in the same township. This was the Belmont Quadrangle Development Co. well on the Costom farm, which got down 4,547 feet when a heavy flow of salt water drowned out a mild show of gas in the Oriskany.

The following were completed as dusters: Homestead Oil & Gas on the John Gregg farm, Bristol Township, Ontario County, at 2,661 feet. The Red Medina was found at 2,532-2,649 feet. Hadley and Rogers on the Cate Bank property, Conquest Township, Cayuga County, at 438 feet. Belmont Quadrangle on the Frank Whelan farm, Kading Township, Schuyler County, at 2,430 feet.

New York wells drilling and temporarily shut down were: Geneva Gas Co., down 1,175 feet on the Stewart Nurseries property, Phelps Township, Ontario County; Trumbull, shut down on the Ethel Arnold farm, Galen Township, Wayne County, at 2,665 feet; Empire Oil & Gas Co., on the Dean estate, Alma Township, Allegany County, drilling at 610 feet; Higgins and others, on the Steadman farm, Allen Township, Allegany County, rigging up, and Tri-State Gas Co., on the N. D. White farm, Bath Township, Steuben County, spudding.

Pennsylvania Operations

United Producers' No. 2 M. Wilsey, Hebron Township, Potter County, got salt water and was abandoned at 5,621 feet. Top of the Oriskany was reached at 5,611 feet. In Tioga County, East Pennsylvania Development Co. was down 1,833 feet on the Presbyterian Church property, Farmington Township. Same county, Gaines Township, E. Cabot was drilling at 1,310 feet on the W. F. Burroughs farm. Cabot also made a location on the John Stiles farm, Clymer Township, same county. The East Penn company was drilling at 1,750 feet on the Roscoe Kemp farm, Farmington Township, same county.

In Potter County, Hanley and Bird were drilling at 5,580 feet in No. 2 S. Gooch, Allegany Township. Peoples Power & Light Co. was drilling at 5,300 feet on its Clair Doty, Hector Township, same county. Cunningham Natural Gas Co. was shut down temporarily at 4,377 feet on the George Carroll, Oswayo Township, same county. Stocum and others were drilling at 4,220 feet on their J. W. Wells, Allegany Township, same county. Electro Geometer was down 3,340 feet on the Katherine Currier farm, same township.

Peoples Power & Light Co. was drilling at 1,745 feet on the Chloe Kenyon farm, Hebron Township, Potter County. Penn United Natural Gas was drilling at 1,760 feet on the Burt and Lyman property, same township. Lycoming was down 220 feet on the W. B. Hemphill farm, same township. Same company was drilling at 550 feet on the W. White farm, same township. Lycoming's other Hebron wells were O. W. Greenman, drilling at 2,160 feet, and R. and G. Carmer, drilling at 800 feet.

Potter Development Co. had a location for its No. 2 Penn State, Hebron Township, and was drilling at 1,285 feet on the B. L. Longworthy farm. Sylvania Natural Gas was spudding in its No. 2 John Higley, same township.

In Genessee Township, Potter County, Bayliss was drilling at 550 feet on the Earl Pye farm. Tioga Natural Gas Co. was shut down at 4,685 feet on its No. 1 Emporium Bank, Shippen Township, Cameron County, and at 4,470 feet on its No. 2 Emporium Bank, same township. Columbia Carbon was drilling at 4,471 feet on the C. Campbell farm, Ridgebury Township, Bradford County.

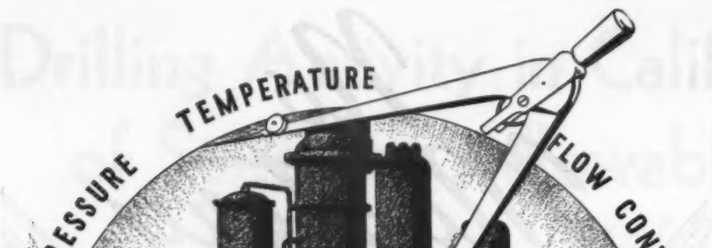
Clarion County Operations

In Clarion County, Kaber and Kiser were running tubing at 1,040 feet on their Carson well, which had an initial daily crude production of 2 bbls. from the Third sand, 1,007-37 feet, Beaver Township. Kelley and others are running casing for the fifth time on their Korb and Beary well, down 765 feet where the top of the sand was reached, Washington Township. Fryburg Motor on the McCloskey farm, Farmington Township, is down 1,765 feet. Jeannerat has completed rig on the Bartlett farm, Piney Township. Alum Rock Gas Co. is spudding at 55 feet on the Bank Lot property, Highland Township. Same company has a bad hole at 50 feet on the Glass farm, Perry Township. Vogelbacher Brothers continue idle at their Pfendler test, Knox Township.

Gilford Brothers are spudding on the Shaming farm, Farmington Township. This is a new location 2 miles northwest of Vowinckel, Pa. Neely made a location on the Oliver Pollock farm, Perry Township, for an oil well to test the Hundred-Foot and Third Venango sands.

ROBERT O. LAIRD DIES

TORONTO, Ontario, Oct. 20.—Robert O. Laird, formerly of Petrolia, Ontario, and widely known as a driller in foreign fields, died here on October 10. Mr. Laird spent many years in the oil fields of Sumatra and Borneo.



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SYRACUSE, N. Y., 640 Gurney Bldg. . . . . O'Brien Steam Specialty Co.
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1183

Operators in Fitts Pool, in Oklahoma, Agree on Plan to Conserve Pool's Big Gas Production

By JAMES McINTYRE

Oklahoma's crude oil allocation for November, fixed by the Federal oil administration, is 459,300 bbls. per day, an increase over the October allowable of 1,900 bbls. per day. Because of the slight difference there may be no change made in the state field allowables when the Corporation Commission meets on October 25 to fix the November figures.

The Marathon Oil Co.'s No. 1 Keefer, NW cor. Section 5-13-3w, in the Edmond district, Oklahoma County, appears to be high on structure. Hunton, Sylvan and Viola lime were all absent in this test and Wilcox sand was found at 6,320 feet and cored from 6,328-40 feet, total depth. It appears to be about 74 feet higher on structure than the company's No. 1 Dahl, a northwest offset. It is believed by some observers that the well will make a big gasser and open developments to the south and southwest.

Agreement in Fitts

Operators in the Fitts Pool in Pontotoc County met in Ada on Friday, October 19, and recommended operating plans with a view of saving the big gas production encountered in wells in that field which are on their way down to the Wilcox oil pay. The plan has been submitted to the State Corporation Commission for consideration at its meeting on October 25. The plan is as follows:

1. Setting of not less than 500 feet of surface pipe of not less than 12½ inches in diameter; this is to hold back the surface water and to protect walls of the well should the shallow big gas break through and attempt to crater.

2. A protection string of casing would be set through the gas sand.

3. If a protection string is not set through the gas sand, then the flow string of pipe is to be set either on top or in the Viola lime.

4. All wells are to be tubed with not less than 2½-inch tubing for production purposes.

5. Bottom hole pressure tests will be made on all wells when they are completed and checked from time to time; these tests are to be reported to the umpire's office.

Osage County

Peters Petroleum Corp. and Norbla Oil Corp.'s No. 1, SW cor. Section 15-25-5, a wildcat, was shut down with a hole full of water from broken Bartlesville sand at 2,862-3,040 feet.

In the South Burbank Field, Phillips Petroleum Co. and C. W. Titus' No. 1, NW NW NE Section 8-25-6, drilled to Burgess sand at 2,845-63 feet and found it dry, plugging back to 2,820 feet. Burbank sand at 2,780-2,817 feet was shot and the well made a 24-bbl. pumper. It was completed.

Skelly Oil Co.'s No. 5, NW SW SE Section 16-25-6, found Burbank sand pay at 2,841-51 feet and shot it with 10 quarts. The well flowed and swabbed 160 bbls. in 24 hours, but was not completed.

The Texas Co. recompleted No. 5 Copahy, CSL NE Section 29-25-8. It was deepened to Burgess sand at 2,442-58 feet, and made a 25-bbl. pumper.

Phillips Petroleum Co.'s No. 16, C SE Section 14-25-11, an old well deepened, got a hole full of water from Siliceous lime at 2,146-62 feet, and was abandoned.

Sinclair Prairie Oil Co.'s No. 1, SE SE NW Section 9-23-7, was dry and abandoned in Arbuckle lime at 3,115-21 feet.

W. C. McBride, Inc.'s No. 37, NW SW NW Section 17-23-12, an old well deepened from 1,598 feet to 1,619 feet, was shot and made a 25-bbl. well.

Johnson Oil & Refining Co.'s No. 1, NW NW SE Section 30-21-9, found a pay at 308-49 feet which was shot with 160 quarts. The well flowed and swabbed 160 bbls. of oil and 100 bbls. of water. It was completed. Clint Moore estate's test in the SW NE NE NE Section 17-21-9, about 3 miles northeast of the Johnson well, had the same sand at 259-80 feet but it was dry and the test was abandoned.

W. C. Norris' No. 4, NW SW SE Section 29-21-11, is a 40-bbl. completion in Burgess sand at 1,936-50 feet.

New work in Osage County reported in the past week includes Reva Oil Co.'s No. 2-B, NW SW SW Section 29-28-11, a location; Midco Oil Corp.'s No. 7 Adlum, NW cor. Section 10-25-6, rig on the ground; Barnsdall Oil Co.'s No. 22, SW cor. NE Section 30-21-9, a rig; Johnson Oil & Refining Co.'s No. 2, C N half NW SE Section 30-21-9, a location; K. L. Wickett's No. 2, 885 feet from north line and 300 feet from east line of SE Section 33-21-10, location.

Creek County

Completions in Creek County in the past week included the following wells:

Wood Oil Co.'s No. 2 Smith-Doolin, Wilcox sand at 2,746-64 feet, shot with 10 quarts, pumped 30 bbls. of oil and 15 bbls. of water.

W. C. McBride, Inc.'s No. 29 Starr, CSL SE SE NE Section 17-18-7, Cushing Pool, Bartlesville 2,352-92 feet, acidized, pumped 35 bbls. the first 24 hours.

Sinclair Prairie Oil Co.'s No. 17 Washington, SW NE NW Section 7-17-7, in the Cushing Pool, dry and abandoned at 2,405 feet.

Bay State Oil Co.'s No. 3 Tiger, NE SW SW Section 2-17-8, Olive Pool, Layton sand at 1,308-54 feet, shot with 170 quarts, flowed 400 bbls. first 24 hours.

Magnolia Petroleum Co.'s No. 8 Street, NW NE NE Section 3-17-8, sand at 1,348-82 feet, shot with 110 quarts, 35 bbls. initially.

C. W. Titus' No. 6 Casey A, NW SE SW Section 3-17-8, sand at 1,295-1,333 feet, shot with 110 quarts, flowed 450 bbls. the first 24 hours.

Curtis Oil Co.'s No. 1 Helton, C NW SE Section 6-17-10, Red Fork sand at 2,172-90 feet, shot with 20 quarts, pumped 25 bbls. first 24 hours.

F. P. Hendry abandoned the location for No. 1 Jacobs, NW SW SW Section 1-15-7, a wildcat on which a rig had been built.

New work in Creek County included W. C. McBride, Inc.'s No. 30 Starr, a twin, CNL NE NE SE Section 8-18-7, building rig; Magnolia Petroleum Co.'s No. 12 Scott, SW cor. SE Section 9-18-7, an old well being deepened, drilling at 2,676 feet after penetrating dry Bartlesville sand, which was shot at 2,573-2,636 feet; Ice Drilling Co.'s No. 1 L. Kin, SE SE NW Section 16-18-9, rigging up; Pure Oil Co.'s No. 6 H. Kernal, NW SE NE Section 30-14-8, an old well being deepened, drilling up iron at 3,535 feet.

Estimated Production

Estimated production by pools in Oklahoma for the week ending October 20 and for the preceding week follows:

	Barrels	
	Oct. 20	Oct. 13
Allen	7,650	7,975
Blackwell district	4,850	4,900
Bristow-Slick	10,250	10,250
Cushing-Shamrock	13,500	13,500
Chandler district	6,250	6,700
Fitts	1,350	1,075
Healdton	9,300	9,350
Hewitt	4,750	5,000
Burbank	9,100	9,100
South Burbank	9,000	9,000
Balance of Osage	25,000	25,000
Lucien	7,325	8,825
Crescent	4,025	4,750
Marshall-Lovell	1,100	1,150
Bowlegs	11,250	10,825
Carr City	5,925	6,125
Earlsboro	10,200	10,175
East Earlsboro	10,025	9,725
South Earlsboro	1,100	1,175
Little River	14,650	14,050
East Little River	700	800
Seminole	10,450	10,225
East Seminole	1,125	1,350
Searight	3,125	3,275
Maud	1,200	1,350
Mission	3,150	3,400
St. Louis-Pearson	20,525	21,375
Keokuk	1,050	3,625
Cromwell	4,600	4,600
Papoose	1,250	1,275
Oklahoma City	158,950	184,805
Asher-West Asher	1,575	1,550
Tatums	6,550	6,000
Sholem-Alechem	4,100	4,250
Duncan	4,350	4,600
Tonkawa-Garber-Thomas	6,325	6,450
Fish	4,050	3,400
Konawa	2,050	2,125
Gray	1,975	2,250
Graham	5,650	5,725
Holdenville	2,700	2,700
Wewoka	4,150	4,200
Yale-Jennings	5,000	5,000
Other pools	61,175	62,350
Total	480,375	513,205

Logan County

Anderson & Kerr's No. 1 James, SE SE NE Section 11-18-4w, Logan County, was completed. It was shot with 40 quarts in Layton sand at 4,735-73 feet and swabbed 125 bbls. initial production.

Gypsy Oil Co. and Sinclair Prairie Oil Co.'s No. 1 Manning, C NW NW Section 3-17-4w, was drilled to a total depth of 6,400 feet, then plugged back to 3,200 feet where the pipe was ripped and the operation shut down for orders. Both Wilcox sands at 6,246-67 feet and 6,300 feet, were practically dry.

Houghton Royalty Co. has abandoned the location for No. 1 Langston University, Lot 4, Block 67, in Section 13-17-1w.

Lincoln County

In the West Chandler area in Lincoln County, Sinclair Prairie Oil Co.'s No. 2 Hopkins was given a small shot in Wilcox sand at 4,997-5,005 feet and swabbed 100 bbls. in 16 hours. In the Chandler district Sinclair Prairie Oil Co.'s No. 4 Norton, SW SE NE Section 7-14-4, was shut down at 5,003 feet, with a hole full of water from sand topped at 4,997 feet.

Okmulgee, Muskogee and Okfuskee

Spartan Pipe Co.'s No. 1-A Tiger, SW

Wildcat Operations in Oklahoma

Week Ending October 20

NORTHERN OKLAHOMA

ALFALFA COUNTY

Acre et al's No. 1 Acre, C SW NE Sec. 14-24-11w.
T.D. 6,460 ft.; lost tools and S.D.

BECKHAM COUNTY

Fred Coogan et al's No. 1 Shelton, SW cor. Sec. 33-10-25w.
Rigging up rotary.

Price and Watchorn O. & G. Co.'s No. 1 Hoard, NE SW Sec. 17-8-26w.
H.F.W. 2,354-57 ft.; abd.

Hivick & Davis' No. 1 Davis, C NW NE Sec. 4-11-26w.
Abd. 3,420 ft.

CADDO COUNTY

H. W. Lee et al's No. 1 Stacey Ferrell, SW NE NE Sec. 3-6-13w; (3,000-ft. test).
T.D. 645 ft.; S.D. for pipe.

Denver Prod. & Ref. Co.'s No. 1 Noe, NW SW SW Sec. 34-10-10w.
T.D. 11,230 ft.; fishing for drill pipe.

CLEVELAND COUNTY

Anderson & Kerr et al's No. 1 Wilson, NW SE Sec. 27-10-1e.
T.D. 6,201 ft.; bailing.

Mid-Continent Pet. Corp. et al's No. 1 Collett, C E½ NE SW Sec. 35-10-1w.
Drlg. 5,960 ft.

COAL COUNTY

Moore & Deaner's No. 1 Edward, NW NE SE Sec. 27-2-8.
Sandy dolomite 6,980 ft.; drlg. 6,995 ft.

J. D. Petty Oil Co.'s No. 1 McMillan, SW NW NE Sec. 16-1s-8.
Drlg. 760 ft.

GARFIELD COUNTY

Ross Cummings et al's No. 1 Gage, SE NW Sec. 27-22-3w.
Spudded and S.D.

GARVIN COUNTY

William H. Atkinson et al's No. 1 Pharoah, NW cor. Sec. 15-3-2w.
Drlg. 4,750 ft.

GRANT COUNTY

Helmerich & Payne's No. 1 Crouse, C NE SW Sec. 29-25-8w.
Drill pipe recovered; reconditioning.

Sultan Oil Corp.'s No. 1 Patton, SW SE Sec. 19-29-3w.
Drlg. 4,632 ft.

HARPER COUNTY

Sinclair Prairie Oil Co.'s No. 1 Neff, NW SE Sec. 21-26-24w.
Drlg. 6,210 ft.

HUGHES COUNTY

Freeman et al's No. 1 Kite, NW NW NE Sec. 8-6-10.
Machine.

Turner et al's No. 1 Williams, SW cor. Sec. 25-7-10.
Rig.

KINGFISHER COUNTY

Jadeka Dev. Co.'s No. 1 Frakes, C SW NE SW Sec. 16-15-6w.
T.D. 7,612 ft.; drill pipe pulled; S.D.

LEFLORE COUNTY

East Okla. O. & G. Co.'s No. 1 Metcalf, SW cor. Sec. 2-4-26.
T.D. 2,040 ft.; hole caved; S.D.

Murdock et al's No. 1 fee, SW NE SW Sec. 15-5-25e.
T.D. 2,425 ft.; S.D.

LINCOLN COUNTY

Tom Bennett et al's No. 1 Bolby, C SE SW Sec. 27-12-2.
Drlg. 5,064 ft.

R. L. Kemp and Comall Oil Co.'s No. 1 Dooley, NE SW Sec. 20-17-6.
Rigging up.

Derrickson and Reserve Pet. Co.'s No. 1 Law, SE SW NE Sec. 25-14-3.
Rig on ground.

M. Murray and Ralph Day's No. 1 Rittenhouse, NW NW NE Sec. 26-14-6.
Hogshooter sand 1,710 ft.; drlg. 1,820 ft.

Sinclair Prairie Oil Co.'s No. 1 Hoyt, NW SW NE Sec. 5-14-3.
Rig.

LOGAN COUNTY

W. N. Anthony's No. 1 Fruin, SE SW Sec. 4-16-1.
Wilcox 5,265-85 ft.; P.B. to 5,181 ft.; will shoot Misener sand.

Gypsy Oil Co. and Sinclair Prairie O. & G. Co.'s No. 1 Manning, C NW NW Sec. 3-17-4w.
T.D. 6,411 ft.; P.B. to 3,200 ft.; S.D.

OKLAHOMA COUNTY

Springrose Drlg. Co.'s No. 1 Edwards, C SE Sec. 19-11-1.
T.D. 6,540 ft.; 400 ft. drill pipe in hole; S.D.

OSAGE COUNTY

Peters Pet. Co. and Norbla Oil Co.'s No. 1, SW cor. Sec. 15-25-5.
H.F.W. 3,040 ft.; S.D.

Reva Oil Co.'s No. 2-B, NW SW SW Sec. 29-28-11.
Location.

Norbla Oil Co. et al's No. 1, SE NW Sec. 19-25-7.
Drlg. 2,715 ft.

PITTSBURG COUNTY

Exchange Drlg. Co. et al's No. 1 Chunn, SE NW Sec. 29-4-14.
T.D. 350 ft.; waiting for csg.

P. H. Gray et al's No. 1 Lee, NW SE Sec. 12-5-13.
S.D. 160 ft.

W. E. Hailey's No. 1 Drew, NW SW Sec. 21-3-14.
S.D. 190 ft.

PONTOTOC COUNTY

Charles E. Carter et al's No. 1 Wood, NW SW SE Sec. 5-4-3.
Spudded and S.D.

S. D. Denton et al's No. 1 Gray, NW SE Sec. 9-4-3.
Cellar and pits.

Benedum & Trees' No. 1 James, SE NW SW Sec. 10-5-3.
T.D. 4,217 ft.; H.F.W.; abd.

E. M. Blanchard's No. 1 Crabtree, NE SE NE Sec. 27-2-6.
S.D. 2,920 ft.

Boyle et al's No. 1 Newbern, SW NE Sec. 31-5-4.
P.B. to 2,050 ft. and shot; H.F.W.; S.D.

Jarrett Pet. Co.'s No. 1 Johnson, SE NW Sec. 28-4-4.
Wilcox sand 1,915-28 ft.; H.F.W.; P.B. to 1,690 ft.

Dandridge et al's No. 1 Stafford, NW cor. Sec. 5-1-5e.
T.D. 740 ft.; S.D.

(Continued on Page 161)

cor. NW Section 19-16-14, Okmulgee County, was dry and abandoned at 1,695 feet. It had a small showing of oil and gas in Glenn sand at 1,660-75 feet.

Ford & McDougal's No. 2 Brown, NE NE SW Section 27-15-13, was dry and abandoned at 847 feet.

Abby Oil Co. was building rig for No. 2 Sango, SE SW SE Section 24-14-11. Campbell and others had spudded No. 1-A Flint, SW NE NE Section 27-14-13.

Sheppard and others' No. 1-B Flowers, a twin, SE SW SW Section 5-13-16, Muskogee County, penetrated a dry sand at 1,680-95 feet and was abandoned at 1,774 feet.

Barnsdall Oil Co. and others' No. 1-A Holmes, SW SW NE Section 27-12-11, Okfuskee County, was abandoned after Wilcox sand at 3,584-90 feet filled the hole with salt water.

W. C. McAdoo and others were rigging up No. 1 Broadnox, NE SW NW Section 31-12-14, McIntosh County.

Panther Oil Co. has rigged up No. 16 Smith, a twin, SW NE NE Section 11-11-11, Okfuskee County. Anderson & Kerr and others had rig up for No. 1 Baumgartner, NW NW SW Section 7-10-8.

Oklahoma County

Watchorn Oil & Gas Co.'s No. 2 Traders Compress, NE NW SE SE Section 34-12-3w, in the northern end of the Oklahoma City Field, was given an eight-hour production test and flowed 1,813 bbls. of oil from Wilcox sand at 6,260-6,400 feet. It was then shut in.

Denver Producing & Refining Co.'s No. 1 Washington, 450 feet south and 690 feet east of NW cor. Section 3-11-3w, was abandoned. It produced from Wilcox sand at 6,374-6,498 feet last April, making 765 bbls. of fluid on the gas lift, 75 per cent of which was salt water. All efforts to make a commercial well of it appear to have failed, even after it was plugged back to 6,400 feet. The well had never been put on the completion list.

Harrell & Davis deepened their No. 1 Fish, 825 feet north and 165 feet west of SE cor. Section 22-11-3w, from 6,502 feet to green shale at 6,580-6,606 feet, and it produced 529 bbls. in 24 hours from Wilcox sand and green shale. It was completed.

Phillips Petroleum Co. and Shell Petroleum Corp.'s No. 8 Berg, was given another test and produced 956 bbls. of oil in 10½ hours and was again shut in.

Greater Seminole Field

Atlantic Oil Producing Co. and Gypsy Oil Co.'s No. 3 Delaware, SE cor. Section 12-9-4, was completed. It was a 755-bbl. initial producer from Hunton lime at 4,195-4,216 feet, which had been acidized.

Morgan Petroleum Co. completed No. 1 Robertson, NE NE SE Section 30-8-4, which swabbed 595 bbls. initially following an acid treatment in Hunton lime at 4,433-50 feet.

Rogers Oil & Gas Co.'s No. 1 McNac, NE NW SW Section 18-8-7, Seminole County, was shut down for orders. Wilcox sand topped at 4,145 feet was shot but made only a showing of oil and a lot of salt water.

The Texas Co. completed No. 1 Reed, NW NW SE Section 27-8-8, in the Wewoka area. It swabbed 549 bbls. of oil from Wilcox sand at 4,182-96 feet.

Smith & Scott's No. 1 Goodin, SW NE NW Section 3-7-4, South St. Louis Field, Pottawatomie County, was acidized in Hunton lime at 3,941-62 feet and swabbed and flowed 570 bbls. in 12 hours.

Darby Petroleum Corp. and Atlantic Oil Producing Co.'s No. 2 Standridge, NW SW SW Section 10-7-4, was acidized and flowed 276 bbls. in 48 hours. Total depth, 3,953 feet.

Jones' No. 1-A Kanatzer, C E half SW SW Section 18-7-4, was dry in Hunton lime at 3,971-4,018 feet. An acid treatment did not help, and the hole was abandoned.

Bryan Petroleum Co.'s No. 1 Green, NW SE NE Section 35-7-4, had dolomite at 4,111-23 feet. It was acidized and swabbed 122 bbls. in 24 hours.

In the Holdenville area Troup and others completed a 40-bbl. pumper in No. 8 Haskett, NE SE SE Section 15-7-8, in Calvin sand at 1,164-1,217 feet.

Empire Oil & Refining Co.'s No. 2 Myers, 200 feet south and 150 feet west of NE cor. Section 31-7-8, was completed. It flowed 596 bbls. initially from Wapanucka lime at 3,071-3,119 feet.

Slick-Urschel, Inc., had not completed No. 1 Reed, SE NW SE Section 31-7-8, in the deep sand part of the Fish Pool. The well flowed 1,111 bbls. in seven and three-quarter hours from Wilcox sand at 4,187-99 feet.

Stanolind Oil & Gas Co. and Amerada Petroleum Corp.'s No. 1 Sarkey, had Wilcox sand at 4,181-90 feet. It flowed 1,255 bbls. of oil in 13 hours.

Winona Oil & Gas Co. and Jarvis & Holm, who opened the deep sand production in the Fish Pool, have Wapanucka production in their No. 2 Myers, NE SW NE Section 31-7-8. The pay was found at 3,118-40 feet and the well swabbed and flowed 193 bbls. of oil and 7 bbls. of water.

Harris & Haun's No. 1 Harjo, NE SE NW Section 11-6-6, a wildcat which had been plugged back from 2,935 feet, was plugged back to 2,115 feet and shot but it resulted only in a hole full of water.

New work in the Greater Seminole district included Continental Oil Co.'s No. 1 Porter, 660 feet from south line and 990 feet from the east line of SW Section 7-9-5, Earlsboro district, Pottawatomie County; Hodge Drilling Co.'s No. 1 Reed, NE SE SE Section 19-8-4, a location; Little River Oil & Gas Co.'s No. 1-A Stanbach, NE NW SE Section 18-8-7, Seminole County, rigging up rotary; Black Gold Petroleum Co.'s No. 1 Bizzell, C NE NW Section 15-7-3, a wildcat locafion; Anderson & Kerr's No. 1 Duvall, SE NW SW Section 7-7-4, cellar and pits; Hunton Oil Co.'s No. 1 Wilsie, NE NE SW Section 7-7-4, cellar and pits; same company's No. 1 Cook, NW cor. Section 8-7-4, cellar and pits; Hodge Drilling Co.'s No. 1-A Hembree, NE NW SE Section 18-7-5, rig; Elliott and Shell Petroleum Corp.'s No. 7 Pickens, NW NW NE Section 15-7-8, rigging up standard tools; Freeman and others' No. 1 Kite, NW NW NE Section 8-6-10, Hughes County, machine.

Pontotoc County

Benedum & Trees' No. 1 James, SE NW SW Section 10-5-3, Pontotoc County, was abandoned at 4,217 feet. A core was taken from 4,199 to 4,217 feet but it showed only salt water.

Boyle and others' No. 1 Newbern, SW SW NE Section 31-5-4, which had been drilled to 3,210 feet, was plugged back to 2,080 feet and was shot at five different levels up to 1,635 feet, but showed only salt water and the operation was shut down.

In the Fitts Pool the Carter Oil Co., which recently bought a number of leases from W. A. Delaney and others, have started operations in the field. Location has been made for No. 1 Lucy Brown, NW SE SE Section 25-2-6, and for No. 2 Sarah E. Craddock, SE SE NE Section 25-2-6.

E. H. Moore and others' No. 2 fee, NE SE SW Section 29-2-7, was deepened from 3,997 feet to 4,042 feet, sand all the way, and the well produced 607 bbls. in four hours through 4-inch connections. It was completed.

Crosbie & Moran's No. 3 D. Hardin, NE SW NE Section 30-2-7, had Simpson at 4,000 feet and sand, sandy lime and lime at 4,030-4,270 feet, total depth. The well produced 2,171 bbls. in seven hours and five minutes with gas at the rate of 6,000,000 feet, producing through tubing. It was completed.

Magnolia Petroleum Co.'s No. 1 Hardin, SW NW NE Section 30-2-7, had the top of the Simpson series at 4,185 feet, and drilled through sands and lime down to 4,400 feet. The well flowed from 50 to 75 bbls. of fluid, 75 per cent water, in three hours. Preparations were being made to shut off the water.

Crosbie & Moran had pits and cellar dug for No. 1-A D. Hardin, a twin, SW SW NE Section 30-2-7.

In Southern Counties

In Jefferson County, H. F. Young and others made a location for No. 1 Bouldin, SE SW SW Section 1-7s-4w.

Bridwell Oil Co. completed No. 3 Wahlgemuth, NW SE NW Section 30-6s-5w. It was a 60-bbl. initial producer at 1,494-1,508 feet.

In Marshall County, Paul R. Robb was cleaning out his deep test at 4,400 feet preparatory to deepening. It is at a total depth of 4,938 feet. The well is No. 1 Vittetoe, C NE SE Section 11-5s-4e.

T. T. Beeler was rigging up No. 1 Wolfe, NE NW SE SW Section 5-5s-5e.

In Carter County, Schermerhorn Oil Co. was drilling at 438 feet in No. 31 fee, C S half NE NW SW Section 5-4s-3w, in the old Healdton Field.

Mudge Oil Co.'s No. 1-A Cox, SE cor. NW Section 25-1s-3w, had oil sand at 2,695-2,765 feet and it swabbed 200 bbls. in 24 hours.

Kerchner & Smith have pits dug for No. 2 Lynn, NE SE NE Section 31-1s-2w.

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Kansas Fields

(Continued from Page 151)

1 Taylor, NW SE SW Section 25-19-8w, was dry and abandoned. Siliceous lime at 3,468-73 feet showed nothing but water.

Rush County

In Rush County W. M. Moore has made a location in C SE Section 15-18-16w, and Treleaven & Brimm were building rig for No. 1 Haas, SW cor. Section 30-18-15w.

Russell County

Hartman & Blair were building rig for No. 1 Sellens, SE NE NW Section 26-15-13w, Russell County. Sinclair Prairie Oil Co. had rig up for No. 1 Sellens, NW cor. Section 36-15-13w. Central Petroleum Co. had cellar dug for No. 2 Benson, C E half E half SW Section 4-14-15w.

Tom Palmer completed No. 3 Borrell, SE cor. Section 21-13-14w, in Silfceous lime at 3,276-80 feet. It was acidized and made a potential production of 1,759 bbls. in 24 hours.

Empire Oil & Refining Co. was building rig for No. 1 Ehrlich, NE NE SE Section 28-13-14w.

Stanolind Oil & Gas Co.'s No. 24 Austin, NE SE NW Section 8-12-15w, an old well deepened from 3,016 feet to Gorham sand at 3,220-25 feet, pumped 31 bbls. of oil and 74 bbls. of water in 19 hours.

Ellis County

Ashby and others' No. 1 Mermis, NW NW NE Section 34-13-16w, Ellis County, was dry and abandoned at 3,509 feet.

ONTARIO GAS LINE

CHATHAM, Ontario, Oct. 22. — The Southern Ontario Gas Co. has commenced construction of its 12-mile gas line to take production from F. H. Stover & Sons' No. 1 in the Dover Field, Kent County. Some 4 miles of pipe have been strung and connected.

EDWIN BOOTH DIES

HAMILTON, Ontario, Oct. 20.—Edwin Booth, formerly a resident of Petrolia and Oil Springs and well known as a drilling expert in foreign fields, died here recently, following a heart attack.

Wildcat Operations in Oklahoma

(Continued from Page 159)

Gillette & Kroeger's No. 1 Robbins, NE SE Sec. 31-1-4.
Drlg. 735 ft.
Gillette & Kroeger's No. 1 Duver, NW SE Sec. 36-1n-6e.
Drlg. 678 ft. (corrected).
J. D. Sledge and Jack Lynch's No. 1-A (twin) Thompson, SW NE SW Sec. 1-1n-7e.
T.D. 3,786 ft.; recovered drill pipe; C.O.
Southern Oil Corp.'s No. 1 Ladd, C NW NW Sec. 27-3-7.
T.D. 515 ft.; set 12-in. csg.

POTTAWATOMIE COUNTY

W. D. Grisso et al's No. 1-A Kenyon, C NE SE Sec. 2-8-4.
Hunton 4,059 ft.; 6-in. csg. at 4,048 ft.

SEMINOLE COUNTY

Anderson & Kerr et al's No. 1 Baumgartner, NW NW SW Sec. 7-10-8.
Rig.
Harris and Haun's No. 1 Harjo, NE SE NW Sec. 11-6-6 (O.W.P.B.).
P.B. to 2,115 ft.; shot H.F.W.
Moran et al's No. 1 Brinlee, SW NE Sec. 27-6-5.
Drlg. 2,698 ft.; showing of oil and gas.
Mudge Oil Co.'s No. 1 Whitney, SE NW Sec. 9-6-7.
Sand 1,935-36 ft.; S.O.
Verser & Clay et al's No. 1 Thomas, NE SE NW Sec. 1-6-6.
Sand 2,074-75 ft.; S.O.

TEXAS COUNTY

Ben F. Ash et al's No. 1 Guymon Townsite, C NE SE Sec. 30-3n-15e (Cimarron Meridian).
Drlg. 1,200 ft.

WASHITA COUNTY

Anadarko Basin Oil Co.'s No. 1 Wolf, NE SW Sec. 33-9-17w.
Rigged up and S.D.
Okla.-Midwestern Oil Co.'s No. 1 Dock, SW cor. Sec. 21-8-18w.
T.D. 2,439 ft.; lost tools in hole; rig rebuilt; S.D.

SOUTHERN OKLAHOMA
ATOKA COUNTY

Brookshire et al's No. 1 Rowland, NW NE NE Sec. 18-3s-10e.
T.D. 3,709 ft.; fishing.
J. D. Boukan's No. 1 Howard, NW SW NW Sec. 20-2s-10e.
S.D. 1,135 ft.; machine moved out.
L. A. Fitts' No. 1 Blankenship, NE cor. NW Sec. 19-3s-10e.
T.D. 651 ft.; S.D.
T. C. Ramler et al's No. 1 Roberts, SW SE SW Sec. 6-2s-12e.
Drlg. 1,140 ft.

CARTER COUNTY

Daphfine Oil Co.'s No. 1 Hooks, SE NW NW SE Sec. 5-1s-2w.
S.D. 2,505 ft.

CHOCTAW COUNTY

J. V. Scrivener et al's No. 1 Swink, C NE SE Sec. 29-6s-20e.
S.D. 810 ft.

COMANCHE COUNTY

F. F Stevens' No. 1 Green, SE SW Sec. 2-1-13w.
T.D. 1,210 ft.; lost bit; S.D.
Heiden & Taylor's No. 2 Crutcher, C NE Sec. 11-1n-13w.
T.D. 863 ft.; fishing for tools.

GARVIN COUNTY

National Prod. Co.'s No. 1 Littrell, NE cor. Sec. 31-2n-3w.
S.D. 351 ft.

JACKSON COUNTY

Burk Royalty Co.'s No. 1 Gore, SE NW SE Sec. 3-1s-20w.
Drlg. 1,600 ft.
Gypsy Oil Co.'s No. 1 Stokes, SE NW SW Sec. 11-1-20w.
Lime 1,709-11 ft.; T.D. 1,723 ft.; S.D.
Gypsy Oil Co.'s No. 1-A (Twin) Kelly, NE cor. Sec. 16-1n-20w.
Shot with 10 qts. at 1,150-70 ft.; no showing; S.D.
Ben Russell et al's No. 1 Unknown, NW SE Sec. 30-1-22w.
S.D. 3,974 ft.

JEFFERSON COUNTY

Geo. Pace et al's No. 1 Jack, NE NW NW Sec. 10-4s-4w.
Drlg. 2,963 ft.
H. F. Young et al's No. 1 Boulden, SE SW SW Sec. 1-7-4w.
Location.

JOHNSTON COUNTY

Gled Oil Co. et al's No. 1 Ferguson, SW SE NE Sec. 26-2s-8.
Top Mayes lime 462 ft.; drlg. 545 ft.

MARSHALL COUNTY

Paul Robb's No. 1 Vittetoe, C NE SE Sec. 11-5s-4e.
T.D. 4,937 ft.; C.O. at 4,400 ft.

MURRAY COUNTY

T. E. Revell et al's No. 1 Wolfe, NE cor. Sec. 18-1-2.
Sand 2,658-70 ft.; show of oil; T.D. 2,710 ft.; S.D.
C. P. Williams et al's No. 1 Singleterry, SE SW NW Sec. 25-2s-3e.
Drlg. 400 ft.

STEPHENS COUNTY

Wm. Angle's No. 1 Johnson, NE cor. SE Sec. 17-1n-8w.
S.D. for wtr., 1,176 ft.
Carter Oil Co.'s No. 1 McCasland, C NW NW SW Sec. 32-1s-4w.
Set 8-in. 4,810 ft.; T.D. 4,840 ft.
Dixie Oil Co., Inc.'s No. 1 Graham, SW SE SW Sec. 13-1n-7w.
Rig.
Finley et al's No. 1 Woolsey, NW SE Sec. 10-2s-6w.
Sand 325-27 ft.; show gas; S.D. 440 ft.
Heenan & Coe's No. 1 Hefner, SE NE SW Sec. 13-2s-7w.
Drlg. 100 ft.
J. W. Madison's No. 1 Tussey, SW SE NW Sec. 24-1n-4w.
Rig down, drill pipe in hole; S.D. 3,220 ft.

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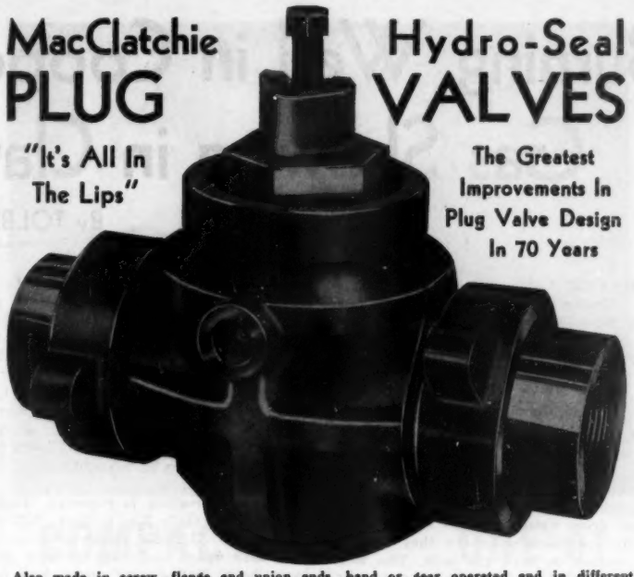

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MacClatchie Manufacturing Co.

Compton (Plug Valves, Pistons and Mud Valves Sold By All Leading Supply Houses) California

The joint filling of Smooth-On No. 1 is more important than the gasket

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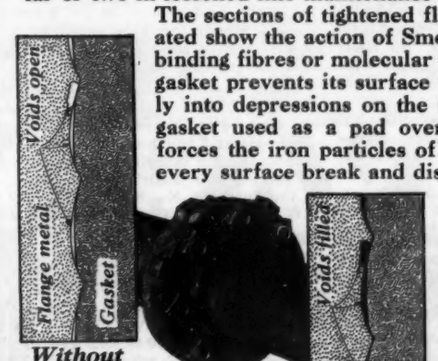

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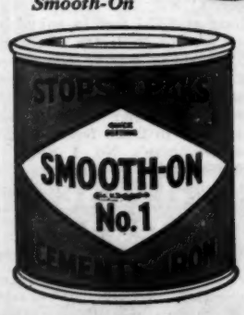

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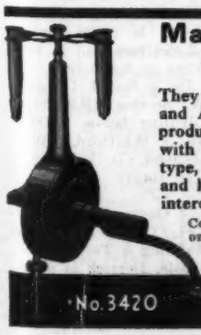

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Burning Well in Cooper Pool Being Controlled; Gas Showing in Clay Basin Structure, Utah

By TOLBERT R. INGRAM
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Oct. 22.—Outside of New Mexico there were no new locations reported in the Rocky Mountain area the past week for the first time since last spring.

NEW MEXICO

Cooper Area

Humble Oil & Refining Co.'s No. 1 Coats, C NW NE Section 10-24-36, 2 miles north of the nearest producer in the Cooper Pool, reported blowing wild last week, has extinguished the fire which burned from October 8 to October 12, and the contractors believe they have a good chance to save the hole. The well gauged 38,000,000 feet of gas a day at a total depth of 3,355 feet, corrected back from 3,385 feet. Attempts to kill the well and continue drilling were still under way. The fire burned around the derrick and through cracks in the earth for a radius of 500 feet. A crew of 18 trained firefighters from Wink, Tex., the Hobbs fire department and all the foamite equipment at Hobbs were rushed to the scene. The gas came from behind the 9⅝-inch casing. After the fire was extinguished the Halliburton company pumped 4,000 sacks of cement and 10,500 sacks of mud in behind the casing in an effort to shut off the gas, which had begun to crater the ground around the derrick. The contractor also is drilling a number of 80-foot relief holes around the derrick.

Three wells are nearing completion in the Cooper area. Phillips Petroleum Co.'s No. 5 Woolworth, C NE NE Section 27-24-36, was drilled to 3,504 feet in lime and given a test at 3,485-3,504 feet and flowed at the rate of 206 bbls. of oil an hour and 2,500,000 feet of gas. The 7-inch was cemented at 3,485 feet and it is waiting for cement to harden before drilling out the plug. Phillips' No. 7 Woolworth, C SE SW Section 23-24-36, was tested at 3,475-3,500 feet, total depth, and flowed 10 bbls. an hour through a three-eighths-inch choke with an estimate of 500,000 feet of gas. Fishing for tubing is in progress.

Texas Co.'s No. 1 Ogg, C SW NE Section 35-24-36, midway between the Cooper and Jal Pools, which gauged 565 bbls. in 24 hours at 3,523 feet, was deepened to 3,575 feet and is drilling out plug to test. The 7-inch is at 3,398 feet.

One new location was released, Empire Gas & Fuel Co.'s No. 1 Everett, C NE SW Section 35-24-36, a diagonal offset on the southwest to Texas Co.'s No. 1 Ogg.

Stanolind Oil & Gas Co.'s No. 2-A Meyers, C NE NE Section 22-24-36, cemented 12½-inch at 244 feet with 210 sacks and is drilling at 1,005 feet in red beds. Phillips Petroleum Co.'s No. 8 Woolworth, C SW SE Section 22-24-36, joint with Pure Oil Co., is drilling at 3,284 feet in lime. Continental Oil Co.'s No. 1 Gates, C NE NW Section 23-24-36, is waiting at 269 feet after cementing 13⅜-inch at 245 feet with 125 sacks. Humble Oil & Refining Co.'s No. 2 Cooper, C NE NE Section 23-24-36, has derrick completed, and its No. 1 Thomas, C SW SE Section 23-24-36, which showed sulphur water at 3,602 feet, plugged back to 3,592 feet with 15 sacks and is running 2½-inch tubing to test. Gypsy Oil Co.'s No. 1 Cooper, C SW NE Section 23-24-36, is waiting at 2,776 feet after cementing 9⅝-inch at 2,772 feet with 850 sacks.

Jal Area

One completion in the Jal area was reported, Empire Gas & Fuel Co.'s No. 2-B Lindley, NE cor. SW Section 13-25-36, slightly east of a group of producers. It was drilled to 3,277 feet and flowed 575 bbls. of oil and 1,000,000 feet of gas in 24 hours from the pay at 3,274-77 feet.

A near completion is Repollo Oil Co.'s No. 1 Hanagan, SE cor. SW Section 12-25-36, which flowed 8 bbls. an hour with 6,000,000 feet of gas at 3,322 feet, total depth. It will acidize before completing.

A new operation is reported, Empire Gas & Fuel Co.'s No. 1 Dyer, NE SW SE Section 31-25-37, in an area on the east side where only one or two wells have been drilled and none has been completed since the fall of 1929. Cellar and pits have been completed.

Continental Oil Co.'s No. 12-A-2 Wells, C NW NE Section 12-25-36, cemented 12½-inch on bottom at 150 feet with 100 sacks and is waiting. Repollo Oil Co.'s No. 1 Gloyd, SW cor. SE Section 12-25-36, had a show of gas at 2,800-10 feet and is drilling at 2,812 feet in lime. The Texas Co.'s No. 2-B Shepard, NW NE SE Section 6-26-37, is drilling at 1,600 feet in anhydrite and salt, and E. B. Guess' No. 1-B Justis, SW NW NW Section 20-25-37, is shut down for orders after spudding to 5 feet.

Eunice Area

One completion was reported in the Eunice Pool, Tide Water Oil Co.'s No. 3 Coleman, C NE NE Section 17-21-36, one location east of its No. 2 Coleman. It is bottomed at 3,925 feet in lime and flowing 920 bbls. a day.

Ohio Oil Co.'s No. 2 State-McDonald, C NW SW Section 14-22-36, 5 miles south of the main development, was deepened from 4,266 feet, where it was making sulphur water, to 4,350 feet. A test at 4,266-4,350 feet showed a dry hole. A 3-inch packer was set at 4,100 feet and it flowed 180 bbls. of water in 19 hours. It will plug back to about 3,900 feet and test again.

Continental Oil Co.'s No. 17-A-4 Meyers, C NE SW Section 17-21-36, an offset to three producers, does not look very favorable at 3,850 feet, total depth. It is swabbing after standing for two days and is making only a little oil and gas.

Continental's No. 8-A-2 Meyers, C SE SW Section 8-21-36, is bottomed at 2,306 feet in sand and anhydrite and is fishing. Atlantic Oil Co.'s No. 1-F State, C SW SW Section 29-21-36, is waiting after cementing 12½-inch at 65 feet with 50 sacks, and Humble Oil & Refining Co.'s No. 1-B State, C SW NW Section 29-21-36, is drilling at 1,482 feet in lime and anhydrite. Gypsy Oil Co.'s No. 2 Bell-Ramsey, C SW NW Section 9-21-36, is drilling at 2,757 feet in anhydrite, and Texas Co.'s No. 2 Rector, C SE SE Section 30-21-36, is rigging up rotary. Skelly Oil Co.'s No. 1 Coleman, C NW NW Section 17-21-36, found the hole 11 degrees off perpendicular at 2,730 feet, and plugged back to 2,126 feet with 250 sacks. Shell-Devonian's No. 1 State, C SW NE Section 20-21-36, is bottomed at 3,989 feet in lime and will core deeper. Test at 3,935-80 feet yielded 10 joints of oil and 10 joints of mud.

Hobbs Area

Shell Petroleum Corp.'s No. 1 Sanger, SW cor. Section 27-18-38, an outside well on the eastern side of the Hobbs Pool, was drilled deeper from 4,160 feet to 4,229 feet and picked up the second pay at 4,208 feet. It is swabbing in. The first pay at 4,118-52 feet tested 468 bbls. in four and one-half hours after being treated with 1,000 gallons of acid. Oil Well Drilling Co. and others' No. 1 Grimes, SW NE SE Section 20-18-38, is drilling at 2,337 feet in salt, and Gypsy Oil Co.'s No. 4 East Grimes, C NE NE Section 33-18-38, is drilling at 2,761 feet in anhydrite.

National Securities Co.'s No. 1 Linam, NE SE SW Section 33-18-37, 4 miles west of the Hobbs Pool, is rigging up cable tools to drill deeper. This test plugged back from 4,272 feet to 4,188 feet to shut off water early in 1930 and then was temporarily abandoned until drilling activities were resumed. It had oil and gas shows at 4,090, 4,155 and 4,215 feet.

Caprock Area

An operation 40 miles northwest of the Hobbs Pool is getting under way in Vierson & Brown's No. 1 Robinson, C NW SE Section 14-11-32, in the Caprock area, where considerable leasing has taken place in the past two years, but where very little drilling has been done. It has cellar and pits completed and is drilling water well.

Lea Area

Texas Co.'s No. 1 Elliott, C NE NE Section 22-20-34, set the 12½-inch at 74 feet with 40 sacks and is waiting, and its No. 1 Swearingin, C NE SW Section 8-20-34, is rigging up cable tools. Same company's No. 4-A Lynch, C SE NE Section 34-20-34, is drilling at 1,220 feet in salt.

Eddy County

Ralph Spearow and others' No. 1 McClelland, SW NW NE Section 22-22-23, Indian Creek district in western Eddy County, a test of the black limes in that area, was plugged and abandoned at 4,980 feet.

Pecos Valley Drilling Co.'s No. 1 McIntyre, N NW NW Section 27-23-25, Dark Canon district, western Eddy County, was abandoned at 3,371 feet in shale. It had water at 3,062-69 feet and 3,345 feet.

Guess & McIntosh's No. 1 State, NW cor. Section 8-26-28, Red Bluff district, southern Eddy County, was abandoned at 2,455 feet in gray sand. It topped the Delaware at 2,360 feet and had water at 2,450-55 feet.

Tignor, Etz & Keyes' No. 1-A Keyes, C SE SW Section 10-17-28, north of the Artesia Field, has been put on the pump. It had a hole full of oil at 1,960-70 feet. Etz, Hammond & Keyes' No. 1 State, C SE SE Section 16-17-28, is cleaning out after a shot of 70 quarts at 1,945-57 feet. Total depth is 1,964 feet. Pecos Valley Gas Co.'s No. 9 Vandagriff, SE SW SE Section 5-17-28, is drilling at 1,280 feet in lime. A. & M. Petroleum Co.'s No. 1 State, SW NE Section 15-21-27, Carlsbad district, is drilling at 495 feet in lime. Leonard, Inc.'s No. 1 Robinson, C NE SW Section 25-16-31, Majamar district, which showed for 24 bbls. a day at 4,050 feet, is drilling deeper at 4,365 feet. Skelly Oil Co.'s No. 1 Lea, C NW NW Section 23-17-31, plugged back from 3,828 feet to 3,812 feet and flowed 38 bbls. in 18 hours. It will acidize.

Chaves County

C. J. Frank and others' No. 1 Roswell Insurance, NE cor. SE Section 30-11-25, is drilling at 915 feet in lime.

COLORADO

Moffat County

Texas Co.'s No. 1 Van Schaick, SW cor. Section 19-12-100, Hiawatha Dome, is bottomed at 2,100 feet and running 6⅝-inch casing. Stanolind Oil & Gas Co.'s No. 14-SD Parkinson, S NE SW Section 22-4n-92, Iles Dome, is drilling at 1,740 feet, and its No. 22-SD Shaw, NW SE NW Section 27-4n-92, has cellar completed.

Routt County

Texas Co.'s No. 8 Quaintance-Hocking, NE SW NE Section 18-6n-86, Tow Creek, is standing at 2,245 feet with casing cemented.

Jackson County

Continental Oil Co.'s No. 3 Hoye, NW cor. NE Section 34-9n-78, South McCallum, plugged back from 2,297 feet to straighten hole and is redrilling at 2,140 feet.

Park County

South Park Oil Co.'s No. 1 State, SE cor. SW Section 16-11s-75, Hartsel district, is straightreaming to set 12½-inch at 320 feet. Water broke in from behind this string originally set at 87 feet.

Larimer County

Eastman & Deininger's No. 1 Cement, NE NE NW Section 30-5n-69, Loveland district, is reported abandoned at 520 feet. It had some gas in the Muddy at 416-485 feet.

Boulder County

Leslie R. Steele's No. 1 Cole, NW cor. NE Section 33-1n-70, Parallel Dome, is drilling at 2,710 feet in shale.

Prowers County

Trojan Oil & Gas Co.'s No. 1 Lotus Oil, NW NE NE Section 15-23-46, Lamar district, lowered the 6⅝-inch to 3,862 feet and is drilling at 3,880 feet in hard lime.

WYOMING

Albany County

California Co.'s No. 1 Holst, NE SE SE Section 13-17-77, Quely Dome, is drilling at 2,241 feet.

Big Horn County

Ohio Oil Co.'s No. 2 Byron Union, C SE NE Section 22-56-97, Byron Dome, is a near completion. It has cemented 8⅝-inch at 5,420 feet and is waiting. The Embar formation was topped at 5,433 feet and cores showed good saturation. It is one-third of a mile south of the company's No. 1 Byron Union, completed in 1926 at 5,514 feet for 600 bbls. initial.

Carbon County

Sinclair-Wyoming Oil Co.'s No. 4 Wertz, SW cor. SE Section 7-26-89, Wertz Dome, drilled to 3,385 feet prior to 1930 by Producers & Refiners Corp., and on which work has been in progress intermittently for several years, is a near completion. Total depth is 3,528 feet. The 4¾-inch is at 3,458 feet and it is cleaning out and bailing at 3,495 feet.

Earl W. Reeder, Inc.'s No. 1 Union Pacific, C SW SW Section 19-20-83, Overland Dome, is drilling below 5,600 feet. Same firm's No. 1 Whitford, SW SE SE Section 24-20-84, is building camp and trucking in rotary rig from California.

Argo Oil Co.'s No. 1 Government, NE cor. SE Section 5-24-87, O'Brien Springs, has let contract to Manning & Terry and is moving in rotary tools. Derrick is up.

Converse County

R. J. Dilger and others' No. 1 Govern-

ment, SE NE SW Section 33-31-72, Poison Lake district, is drilling at 716 feet.

Fremont County

Mid-American Oil Co.'s No. 1 Government, S NE SW Section 4-28-92, Sheep Creek, is being abandoned at 3,460 feet, where it was close to 900 feet in the Embar, the formation being tilted almost on edge. It is probable another well may be drilled farther back from the fault. Union Oil Co. of California drilled in the SE SW SE Section 10 several years ago, topped the red beds at 737 feet and was still in that formation when it was abandoned at 3,905 feet.

Monongahela Oil Co.'s No. 1 Jones, NW cor. Section 7-28-92, Spring Creek, drilled to gas horizon at 1,136 feet, total depth, is being abandoned. It failed to find gas in commercial quantities. Another well probably will be drilled in the spring. Same company's No. 1 Wisda, NE SE SE Section 13-28-93, Crook's Gap, is drilling at 2,785 feet.

Hot Springs County

California Exploration Co.'s No. 1 Government, NE SE NE Section 12-44-97, Waugh Dome, set 10¾-inch in the top of the red beds at 2,535 feet and is drilling at 2,680 feet. This marker indicates top of the Embar, the first objective, will be encountered at around 3,700 feet.

Lincoln County

Senrab Oil Co.'s No. 3 Government, N SE NW Section 10-26-113, La Barge district, is drilling at 660 feet.

Natrona County

Sinclair-Wyoming Oil Co. is cleaning out and deepening a number of old wells in Salt Creek. Some of these were acquired from the Producers & Refiners Corp. at receivers' sale and practically no work has been done on them for years. Sinclair-Wyoming operations are as follows: No. 1-C, NE NW NW Section 12-39-79, total depth, 2,244 feet, bailing at 2,236 feet. No. 1-N, SW cor. SE Section 18-40-78, total depth 2,723 feet, cleaning out and drilling by iron at 2,690 feet. No. 1-O, NW SW NW Section 18-40-78, bailing at 2,505 feet. No. 4-J, NE SE SE Section 30-40-78, total depth 2,334 feet, cleaning out and sidetracking iron at 2,320 feet. No. 5-F, NE SE NW Section 19-40-78, drilling by iron and cleaning out at 2,500 feet. No. 8-J, NE cor. SE Section 30-40-78, total depth 2,562 feet, sidetracking iron at 2,515 feet. No. 12-P, SW cor. Section 20-39-79, total depth 2,843 feet, bailing at 2,840 feet.

Park County

Dry Creek Oil Co.'s No. 1, NE SW Section 9-50-100, South Oregon Basin, which killed a flow of 14,000,000 feet of gas in the first Frontier to drill deeper, is standing with 6⅝-inch cemented at 1,093 feet, below the gas sand.

Weston County

Irene Eaton's No. 14, NE SW Section 30-46-63, Osage Field, is drilling below 350 feet, and the Western States Oil Co.'s No. 10 Bock, W SW NE Section 14-46-64, is drilling below 300 feet.

Sublet County

Calmonica Petroleum Co.'s No. 17-3, NW cor. NE Section 17-27-113, La Barge district, tested 7 bbls. a day on the pump at 2,093-2,100 feet and is pulling tubing to drill deeper.

Sweetwater County

Sinclair-Wyoming Oil Co.'s No. 76, SW cor. NW Section 11-26-90, Lost Soldier district, which probably will be tested to the Tensleep, is waiting after cementing pipe at 332 feet. Other Sinclair-Wyoming operations, which include the cleaning out and deepening of old wells, follow: No. 28-S, NW SE NE Section 10-26-90, waiting on cement at 655 feet. No. 46-A, SE cor. Section 3-26-90, total depth 1,782 feet, rigging up to pull the 5½-inch liner and clean out. No. 51-A, C SW SW Section 11-26-90, drilling at 466 feet in sandy shale. No. 60, C SE SE Section 3-26-90, standing at 1,901 feet.

Vermillion Oil Co.'s No. 1 State, SW cor. Section 16-12-99, a test on the northeastern flank of the Hiawatha structure, standing at 4,685 feet for some time, is building new derrick.

MONTANA

Glacier County

Ninety per cent of the operators in the Cut Bank Field and 80 per cent of the operators in the Kevin-Sunburst Field have signed the agreement not to start new wells or acidize wells without the permission of the Montana Petroleum Conservation Board in a co-operative move to hold down production and avoid proration. There were no completions or new operations started in Cut Bank this week. Routine operations follow:

C. P. Castle's No. 1 State, SW cor. Section 36-35-6, rigging up. This location was changed from the center of the 40 to 346 feet east and north of the west and south lines. The prevailing rule is to drill in the center of the forties. A. B. Cobb's No. 4 Walberger, a direct offset to the Castle well, may change its location from the C SE SE Section 35-35-6w to the southeast corner of the section. Consolidated Gas Co.'s No. 1 Tribal, E NE NE Section 34-35-6w, is rigging up, and its No. 2 Tribal, NE SE NE Section 34-35-6w, has rig on location. Fisk and others' No. 1 Harper, C NE NE Section 21-34-6w, is drilling at 1,200 feet. Lon Crumley's No. 1 Jones, C NW SE Section 31-34-5w, is drilling at 2,730 feet.

Hannah-Porter Co.'s No. 2 Britton, SW NE NE Section 23-34-6w, is drilling at 1,850 feet. Indian Oil Co.'s No. 1 Reikhoff, SW SE Section 3-34-6w, is fishing for bailer at 1,940 feet, total depth, and its No. 2 Winkler, W SW SW Section 23-35-6w, is fishing at 2,585 feet. R. C. Jeffries' No. 1 Lukens, C SE SE Section 1-33-6w, is fishing for bit at 1,805 feet, total depth. Lawler & Hoer's No. 2 Harland, C NW NW Section 8-33-5w, is drilling at 2,230 feet.

Montana Headlight Oil Co.'s No. 3 Yunck, W SW SW Section 1-34-6w, set the 7-inch at 2,735 feet and is drilling in at 2,745 feet. Montana Power Gas Co.'s No. 1 De Zort Unit, 700 feet N of CSL Section 23-35-5w, set 6⅝-inch at 2,750 feet with 50 sacks, and is drilling at 2,755 feet, and its No. 1 Gaines, C NW NE Section 6-33-5w, is drilling at 1,645 feet. Same company's No. 1 Sheuren, C SW SW Section 21-33-5w, in the southern part of the field and a mile southeast of its No. 1 Neil, is drilling at 2,945 feet and getting rather deep. Olive Oil Co.'s No. 2 Winkler, W NW NE Section 35-35-6w, is drilling at 2,610 feet, and its No. 3 Winkler, W NE NW Section 35-35-6w, is digging cellar. The Santa Rita Oil & Gas Co.'s No. 4 Cardwell, NE NE Section 22-35-6w, cemented the 7-inch on bottom at 2,850 feet with 50 sacks, and its No. 4 Tribal, C N half SW Section 15-35-6w, is drilling at 2,465 feet.

R. C. Tarrant's No. 5 Haglund, Jr., C SW NE Section 13-34-5w, is drilling at 1,525 feet, and his No. 3 Miller, E NE NE Section 24-34-6w, is drilling at 860 feet. Tarrant's No. 1 State, C SE SE Section 36-34-6w, is drilling at 2,720 feet. Texas Co.'s No. 1 Jones, C NE NE Section 6-33-5w, is standing with the 7-inch cemented at 2,816 feet, and its No. 1 Kneale, C SW NW Section 14-35-6w, is drilling at 2,312 feet. Last named made 2,000 feet of hole the past week. Texas Co.'s No. 5 Purdy, NE NW NW Section 35-35-6w, was abandoned at 300 feet and rig skidded 385 feet south.

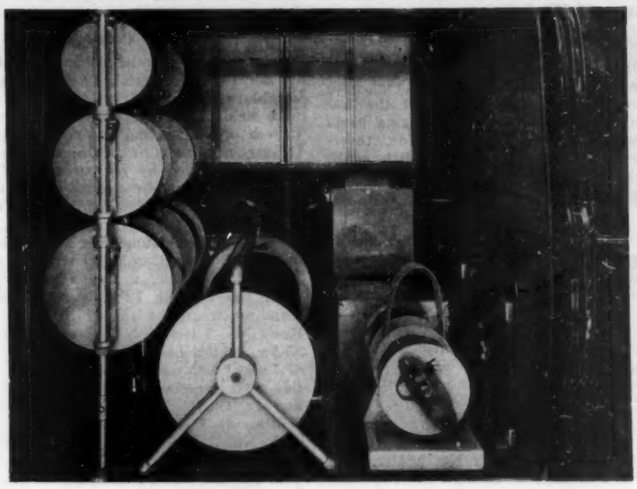
Watson and others' No. 1 Simero, NE SW NE Section 1-33-6w, is drilling at 2,220 feet.

Cascade County

Ralph Chamberlain and others' No. 1 Heldman, near C SE Section 6-19-2w, Crown Butte, is drilling at 2,100 feet.

Big Horn County

Enterprise Oil Co. and others' No. 2 Lynde, SW cor. SE Section 21-6s-35, Lodge Grass Creek, set 4½-inch at 3,605 feet, lost circulation and left 1,200 feet



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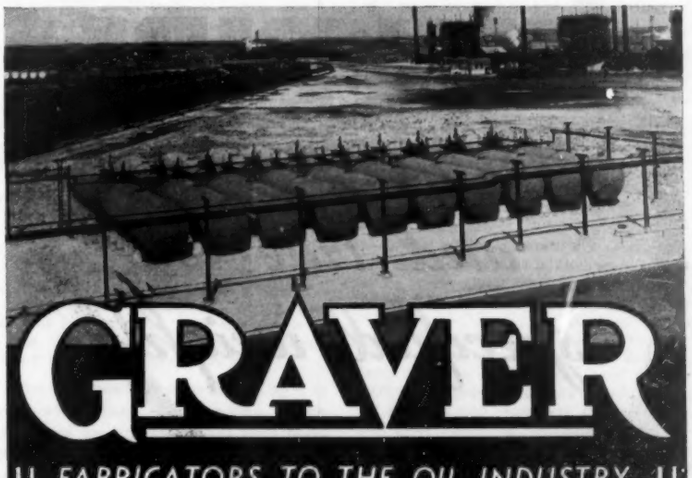

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of cement in the hole. It is cleaning out at 3,200 feet. It was through the Dakota series at 3,450 feet.

Carbon County

Ohio Oil Co.'s No. 14 Maddox, C NW NW Section 10-7s-21, Dry Creek, encountered water in the top of the Lakota at 6,112 feet and is plugging back. This well is on the west side, three-fourths of a mile west and a little south of the nearest producer and the same distance south of a producer in the C SE NE Section 4.

Fergus County

H. Clark Rowland and others' No. 1 Woodward, SE cor. SW Section 20-14-24, Button Butte, is drilling at 2,940 feet in the Madison.

Petroleum County

Guy Smith and others' No. 3, NE SE SW Section 33-14-26, Flatwillow, is drilling at 236 feet.

Stillwater County

Continental Oil Co.'s No. 1 Orr, SW NW SE Section 18-5s-17, Dean-Ingersoll structure, is drilling at 1,335 feet.

Teton County

Ned Cheadle and others' No. 1 Balsinger, NE SE NW Section 20-27-5w, West Pondera, is bottomed at 2,470 feet and underreaming the 4¾-inch at 2,346 feet.

Toole County

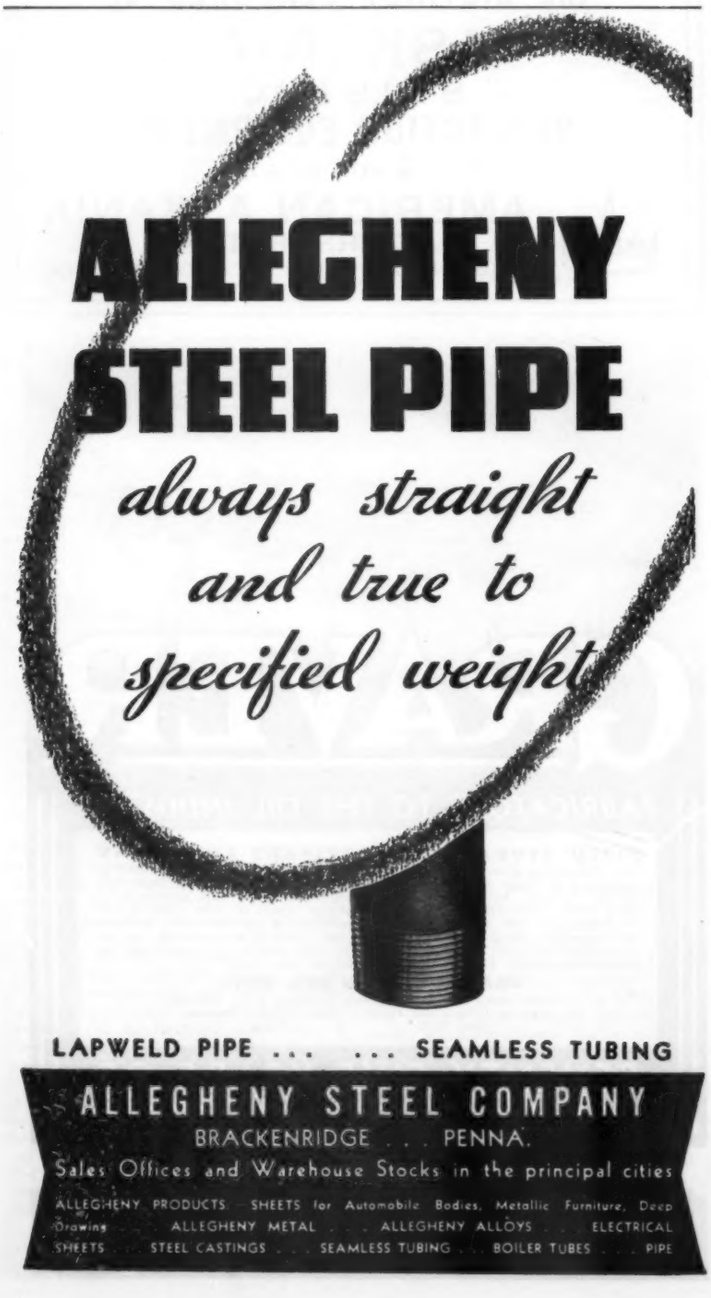
The recent spurt in drilling operations in the Kevin-Sunburst Field due to favorable results from treatment of wells with acid is slowing down with the approach of winter and the agreement not to start new wells or acidize wells, which has been signed by 80 per cent of the operators. Only four operations were reported this week, of which two are completions.

Imperial Petroleum Co.'s No. 14 Blum, SW NE NE Section 19-35-1w, was completed for 4 bbls. a day at 1,635 feet from the pay at 1,620-30 feet and is standing treated with acid. E. R. McKee's No. 8 fee, N NW SW Section 19-35-1w, which had only a show in sand at 1,490-1,530 feet, swabbed 48 bbls. initial after treating. A. Beardsley's No. 3 Swears, C SE NW Section 9-35-2w, is drilling at 1,575 feet, and Bi-State Oil Co.'s No. 3 Haemel, E SE NE Section 3-34-1w, is drilling at 1,300 feet.

T. P. Kyle's No. 1 Clark, SW cor. SE Section 19-37-1e, Bow and Arrow structure, is drilling at 300 feet.

UTAH

Mountain Fuel Supply Co.'s No. 2 Murphy, NE NE Section 21-3n-24, Clay Basin, Daggett County, cemented 8⅝-inch at 5,627 feet on top of the Dakota sand in which the cores showed gas saturation.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Michigan Fields

(Continued from Page 153)

Oil Co. as No. 1 D. Ross and Hazel Sullivan, NE SW NW Section 33-12n-3w.

Havens Oil & Gas Syndicate's No. 1 Alice M. Schmidt, SW NE SE Section 3, Canton Township, Wayne County, was reported drilling at about 500 feet after striking a show of gas.

Two in Shiawassee County, one in Howell and another in Genoa Township, Livingston County, and one each in Lyon Township, Oakland County, Benton Township, Eaton County, and Pinconning Township, Bay County, complete the state record.

New Locations

Permits for seven new locations were issued. Two are for new West Branch Township, Ogemaw County tests. The West Branch locations are: Youmans-Dalton Oil & Gas Co.'s No. 1 E. Hustead, NW NW SE Section 36-22n-2e, and W. J. Sovereign's No. 1 Ransom S. Swain, SW NE SE Section 19.

The other permits are: Great Northern Oil & Gas Syndicate's No. 1 James M. Olmsted and Wife, SE SE NW Section 23-13n-3e, Tittabawassee Township, Saginaw County; Smith Petroleum Co.'s No. 1 Edward E. Parlberg, NW SW SE Section 20-10n-6e, Birch Run Township, Saginaw County; Taggart Brothers, Inc.'s No. 9 on the Oscar Schuberg lease, C SW NE Section 4-14n-9w, Austin Township, Mecosta County; Secord Oil & Gas Co.'s No. 1 C. Van Houghton, C NE SW Section 35-13n-7w, Millbrook Township, Mecosta County; John Vale and E. C. Ward's No. 1 Ivan Flowers, C SE NE Section 33-15n-7w, Sheridan Township, Mecosta County. L. A. Johnston's No. 1 W. L. Oviatt estate, SW SE SW Section 24-16n-2e, Mill Township, Midland County, will be drilled by Goll, Graves & Mechling, Inc., new lessee.

Gordon Oil Co. has made location for its No. 1 Engleman, SW NW Section 9-15n-8w, Martiny Township, Mecosta County, and Columbia Oil & Gas Co. is reported moving in for No. 1 Arnett, NW SE Section 23-13n-8w, Hinton Township.

Eastern Fields

(Continued from Page 146)

A. E. Ellis and others have part of the material for a test on the C. C. Pickens farm. In Center district McCall Drilling Co. has reached 400 feet in a second test on the M. S. Cawthorn farm.

In Kanawha County, Godfrey L. Cabot, Inc., has four wells drilling. In Malden district, No. 7 on the Campbells Creek Coal Co. tract is down 2,083 feet and No. 8 down 485 feet. In Cabin Creek district No. 47 on the A. D. Huntington farm has reached 850 feet and No. 48 is at 294 feet.

In Marion County, Monroe and Laughlin are drilling No. 3 on the A. D. Wells farm in Mannington district. In this district, Maxon Oil & Gas Co. has started drilling on the Ash heirs farm. Delmar Oil Co. reached 3,183 feet on the Z. E. and A. M. Batson farm and shut down testing.

Ritchie County

In Ritchie County several new locations have been made in Murphy district. J. F. Deems has made a location on the C. J. Williamson farm. Clem S. Morris has one on the M. S. Drake farm, a test. W. H. Bickle has made one on the S. Hardman farm, also a test. King Knob Oil Co. has made a location for No. 3 on the Emma V. Weinrick farm. L. P. Bickle is down 400 feet in No. 3 on the P. W. Morris farm. Kelley and Mason have a rig on the B. F. Fleming farm. In Clay district, H. N. Rinehart has a location on the George Millbarger farm. Lucas and others have begun drilling on the J. F. and Laura Kelley farm. Both are in the Pike Pool. S. E. Mackey and others are nearing the Injun sand in a second test on the Charles Wilcox lot. C. L. Donaldson and others are drilling at 650 feet on the J. P. Strickler farm. Athey and Yeager are down 1,500 feet on the W. H. Yeager farm, a test. In Grant district, R. W. Richards is building a rig on his own property. In Union district, Jobes and Prunty are down 1,590 feet on the R. G. Davis farm.

In Roane County, George E. Smith has made a location for No. 2 on the L. A. Short farm in Spencer district. In Curtis district Henderson Oil Co. is down 975 feet in No. 3 on the F. H. Bee, Jr., farm. In Smithfield district, United Fuel Gas Co. has started drilling No. 4,536 on the T. Ferrell farm. Howard Bartlett is rigging up on the Leonard Brannon farm.

In Wetzel County, Jason Wade and others are drilling at 1,080 feet on the Joseph Shuler farm and 200 feet on the Lewis Taylor farm, also a test. Both are in Proctor district. In Center district, Blank Oil & Gas Co. has reached 2,000 feet on the James Garrett farm.

University Bulletin on Geology of Texas

The Bureau of Economic Geology, University of Texas, publishes bulletins covering the various areas of Texas, available at the cost of printing and distribution which can be secured from the bureau by placing a standing order or by individual orders.

One of the most recent publications is the "Geology of Texas, Volume 1," Bulletin 3,232, edited by E. H. Sellards, W. S. Adkins and F. B. Plummer. It contains 1,007 pages and 54 text figures and costs, with map, $3.25 paper covered and $4 cloth bound.

A list of publications issued by the bureau may be had by writing E. H. Sellards, chairman of the division and director of the Bureau of Economic Geology, the University of Texas, Austin, Tex.

Canadian Fields

(Continued from Page 155)

tered oil in small quantities in the Trenton limestone at 825 feet and is deepening.

Senator Operations

Senator Oil & Gas Development Co. of Ottawa is carrying on drilling operations in two areas. In the Wainwright Field, east central Alberta, Senator's No. 1, LSD 1, Section 23-44-6w4, is resuming from 708 feet. At Hudson's Bay Junction, in northern Saskatchewan, a new test is drilling in limestone below 300 feet. The company holds eight leases on the Blackfoot structure in Saskatchewan adjacent to acreage being tested by the Blackfoot Gas & Oil Co.

Drilling in Ontario

In the Tilbury Field, Kent County, Ontario, Ladd & Ziegen Syndicate's No. 1, Guy Mifflin farm, S, Lot 7, Concession 14, Tilbury East Township, is being finished in the Tilbury sand with an estimated flow of 200,000 feet a day.

Gulf Coast Fields

(Continued from Page 149)

Parish, Humble Oil & Refining Co.'s No. 1 Martin Kratzer, one-half mile southwest of the discovery, completed for a gas well at a total depth of 8,830 feet, and is rated as a 4,200,000-foot gas well. Shell Petroleum Corp.'s No. 1 Jarnigan failed to flow after plugging back to 8,748 feet and it is now shut down. It is an east offset to the discovery well.

Phillips Petroleum Co.'s No. 1 Sibille, Port Barre Field, St. Landry Parish, has been abandoned at approximately 4,435 feet. Location is in Section 7-6s-6e.

Pure Oil Co.'s No. 6 Alliance Trust Co., Gueydan Field, Vermillion Parish, is drilling in shale below 9,268 feet. It is on the north edge of the dome and is the deepest drilling test on the Gulf Coast. It has encountered several showings of oil. Location is in Section 33-11s-1w.

TECHNICAL QUESTIONS ANSWERED

By Charles K. Francis, Ph. D., Technical Editor

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline, and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible.

Inquiries must be signed but only the given initials will be printed. The source of the question is considered to be confidential.

Questions requiring a discussion of patents, the use of intricate formulas, extended computations, or cost estimates cannot be considered.

When the matter is of general interest the reply will be published within a reasonable time.

Paraffin Wax in Road Oils and Asphalts

What is the action of wax in road oils and asphalts? What per cent may be allowed?—O. R. A.

The relatively small quantity of wax usually present in road oils and asphalts is not sufficient to have a marked influence. The softening point may be lowered a degree or so when quantities exceeding 5 per cent of paraffin are present in an asphalt, but there will usually be a large decrease in viscosity and adhesive time will be reduced.

There has been much discussion concerning the influence of wax on the properties of asphalt. Some authorities claim that the wax content is not the controlling factor, but that the composition or type of the crude oil is very important. The asphaltic hydrocarbons must not be diluted with large quantities of paraffinic hydrocarbons. A small percentage of paraffin is without influence, especially if the wax does not have a high melting point, and the tendency to form large crystals. Road oils are sometimes injured when cut back with a distillate containing excessive quantities of wax.

Longinus has observed that the ductility of waxy bitumens falls off markedly on heating, and has also concluded that the value of asphaltic bitumen for road-making purposes is largely determined by the paraffin and sulphur contents. Bandte considers that the properties depend on the chemical constitution of the bitumen as a whole and that treatment and methods may be found enabling good roads to be prepared from asphaltic bitumen at present considered to be of low quality. One author states that bitumens containing much paraffin expand on cooling because of the crystallization of wax and form a rough surface, being therefore unsuitable for road-making, roofings, etc. Another points out that the paraffins differ in chemical and physical properties and that occasionally they may act as plasticisers in a desirable way. Manheimer explains the effect of paraffin content on mechanical properties by the crystal size, e.g., the crystals of paraffin present decreasing with increase of vacuum used for the distillation and with heating in the presence of air.

The adhesive or binding property of road oils and asphalts is of first importance; so the tendency of wax to lower this must be considered. The analytical methods do not permit ultimate precision so it is safe to consider an actual paraffin content of 5 per cent as the limiting quantity; however, asphalts said to contain 7 per cent wax have been reported to have been satisfactorily used.

Discussing this subject before the World Petroleum Congress, London, July 19-2, 1933, Doctor Riehm reported the following:

To a Mexican bitumen, containing only traces of paraffin wax, there were added 4, 8 and 12 per cent of paraffin wax, having a melting point of 54° C., with the following results:

Kind of Bitumen	Softening point	Viscosity—British road tar viscometer— 90° C.	80° C.	70° C.	Time for adhesion (seconds)
Mexican Bitumen 100%	46-48° C.	18	42	93	5
Mexican Bitumen 96% + 4% par. wax	46-47°	7	17	40	7
Mexican Bitumen 92% + 8% par. wax	44-45°	3	7	15	25
Mexican Bitumen 88% + 12% par. wax	43-44°	indeterminable			40

The influence of paraffin wax on the softening point is small, but on the viscosity considerable, whilst it is much more pronounced on the adhesiveness and almost destroys it at higher percentages.

Adhesiveness being a paramount property of bitumen both in road construction and in the roofing industries, it is absolutely necessary to restrict its paraffin wax content. A paraffin wax content of 2.5 per cent analytically determined, corresponding to an actual content of about 5 per cent should be considered to be the limiting value for a good quality of bitumen. In addition, it seems advisable to include in the tests one for adhesivity which, notwithstanding its simplicity, yields serviceable results.

Petroleum Oils Not Considered as Spontaneously Combustible

Can there be such a thing as self-ignition of a petroleum oil at ordinary temperature as a result of a chemical change within the oil itself?—D. W. D.

Certain oils of vegetable and animal origin have a tendency to unite with the oxygen of the air and in some cases the oxygen enters the molecular structure so rapidly that considerable heat is generated. When the conditions are favorable, such as where rags or waste more or less saturated with linseed oil, for example, are exposed to the air, the temperature may rise high enough to cause a fire. This kind of chemical reaction is not known among the petroleum oils, for the reason that the paraffin hydrocarbons do not readily unite with oxygen. The only conditions where there may be spontaneous ignition of a petroleum oil is when the oil has been heated to a high temperature, above the kindling point, and then released to the atmosphere, or when placed under a high pressure and mixed with air, as in a Diesel engine. This does not happen at normal atmospheric temperatures and pressures.

Sometimes spontaneous combustion is offered to explain the origin of a petroleum fire but the direct cause, when found, is invariably traced to some other factor. Static electricity and deposits, due to the use of chemicals or the chemical action of sulphur on iron, are responsible for some fires and explosions that may have been termed spontaneous.

Static electricity is especially dangerous where any petroleum liquid is being handled. It is especially to be guarded against where the most volatile liquids, such as gasoline, naphtha and kerosene are involved.

Self-igniting deposits, pyrophoric substances, are sometimes found about treating systems in refineries and gasoline plants, also in the upper parts of tanks where a high sulphur oil has been stored. This condition is not found so often as static electricity but has apparently been the cause of some fires.

It is clear from the above that such action cannot be attributed to the chemical structure of the petroleum oil; the fire resulting from an outside influence, as if, for example, a person might introduce a lighted match.

Conditions for Burning Fuller's Earth and Control Tests

What is considered the proper temperature to be used when reburning Fuller's earth and what tests should be made to test the earth to show that it is in the best condition to be used again?—P. O. S.

The important point to always have in mind when burning a filter clay, whether new or used, is that there shall be no glazing of the particles because of too high temperature and direct contact with the flame. The object of the heating is to remove free water and organic matter without disturbing the structure of the clay particles. If the temperatures are high enough to disengage any part of the chemically combined water a breaking down of the molecular structure starts with consequent injury to the clay as a filtering medium.

Burning temperatures ranging between 900° and 1,000° F. are considered good but some operators move the clay at high speed under a temperature of nearly 1,400° F., the contact time under this condition may be about one-half minute and at the lower temperature it may run as long as four hours. Experimental tests indicate 1,100° to 1,200° F., clay temperature, for 15 minutes, with a large excess of air, as a very satisfactory condition for treating used clay. Raw clay should not be heated above 900° F.

An important factor is that reburned clay should go direct to the filters, after cooling, and should not be placed in storage.

The general rule is to burn new earth to a 4 per cent volatile content, which should give a weight of 33/36 pounds per cubic foot for 30/60 mesh Fuller's earth.

Used clays may be burned to 2 per cent volatile content, but no lower. The control tests made in the laboratory include: oil content, per cent volatile matter, volume weight, and percolation tests for color as reflected by a standard color solution or a standardized oil. The microscope is sometimes used to detect glazing. Reference—S. R. Funsten, Cost of Oil Percolation Filtration; The Oil and Gas Journal, June 7, 1934.

Lead Susceptibility of Various Types of Gasoline

We produce a naphtha from a 38° A.P.I. crude which at certain points below 400° F. endpoint requires only 1.2 c.c. to give a rise of 10 octane numbers. We understand that 1.5 of lead will give an increase of 10 numbers and this applies very well to another crude of 30° A.P.I. What causes the difference?—A. T. B.

There are several conditions that may have something to do with what is termed lead susceptibility when adding ethyl lead fluid to gasolines for the purpose of increasing the octane numbers.

It must be assumed that a difference in the quantity of lead required for two gasolines to meet a fixed octane standard is not due to the conditions of test. It is well known that any variations in temperature and engine adjustments may result in considerable difference in the indicated knock ratings.

One of the earliest workers to study combustion knock as related to hydrocarbons was H. R. Ricardo. He found, in 1920, that the composition of the fuel had much to do with the tendency to knock while being consumed in the cylinder. The aromatics reduce the knock to a remarkable degree, the naphthenes and olefins much less. It requires approximately 5 per cent olefins or 4 per cent naphthenes to equal 1 per cent of aromatics. Terpenes suppress knock, so do the primary and secondary amines. Ortho and para forms of toluidines and xylidines are also knock reducers. Some sulphides lower the knock, as illustrated by carbon bisulphide. The alcohols have a lowering effect on the knock rating, as shown in alcohol blends. Numerous other substances having a value as knock inhibitors, might be mentioned, but the several substances that have been named are all possibilities as constituents of the gasoline made either direct from some crude oils or found during the cracking operation. The kind of compounds and the quantity depending upon the type of crude oil and cracking conditions.

Another factor is volatility. As a general rule a higher octane number may be expected for the gasolines having the lower initial boiling points. As the end-point rises there is a tendency for the octane number to drop.

It is also true that there is a difference in the octane value of the several hydrocarbons found in gasoline. Selections may be made of certain fractions and by a series of rejections and blending it may be possible to make a gasoline of higher antiknock rating than where only the primary distillate is utilized as made.

FIELD PROBLEMS FROM READERS

Edited by Thomas F. Smiley

This department is conducted in order that men connected with the drilling, producing and transporting branches of the petroleum industry may obtain aid in solving problems that confront them in their work. Readers are invited to send questions freely. These questions will be placed in the hands of persons capable of answering them authoritatively, and the answers, based on the best available information, will be published.

Each question should give as much detail as possible, especially if it involves depths of sands, types of sands and operations on adjoining or nearby properties. The source of questions will be considered confidential, and only the initials of the sender will be published. Questions involving patented processes, intricate formulas or estimate of cost cannot be answered. If an immediate answer is important, one will be given by mail when the writer requests it.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or improved old ones.

Expected Good Oil Well, But Got Small Naphtha Flow Instead

We recently drilled a well to about 5,000 feet into the lime in the Turner Valley Field and got an insignificant flow of naphtha, whereas we had expected to have 400 to 500 bbls. of oil. We knew we were in a proven district and should have a large flow. The result of our drilling was known to the entire field and we have had a great number of recommendations. The diameter of the hole at the finish was 8 inches, the usual size in this field. Several persons recommended installation of a 2-inch pipe to the bottom of the well on the theory that our gas pressure was not strong enough to lift whatever naphtha there was at the base of the well to the surface through an 8-inch pipe. A 2-inch pipe, they said, would yield a constantly increasing flow of naphtha. Others asserted that while this method had been successful in many oil fields in the United States, naphtha presented a totally different proposition and installation of the 2-inch pipe could result in nothing but failure. We would like to have your advice and would like to know too whether the naphtha is in fluid form at the bottom of our well or in a gaseous condition as it appears at the separators.—W. J. M.

This department does not know of any well such as you describe that is flowing through tubing. You have omitted from your statement well conditions needed by engineers consulted in forming an opinion as to what might best be done to cause your well to flow.

From such facts as are given it is suggested that you might consult with some company which could treat your well with hydrochloric acid, because it is assumed that it is producing from the limestone formation. This type of treatment has made producers out of many wells in this country that were drilled into limestone and when first completed had very small showings, but after the acid had eaten into the formation the wells proved to be good commercial producers. This statement applies equally to gas or oil wells.

From this start it might then be assumed that if your well is delivering its production in the form of either gas or fluid, the tubing will be of advantage if the well is shut in at the top of the casing so that pressure is built up in the annular space between the tubing and casing with the top of the tubing for the escape of the well's production.

The statement that attempting to flow a small well through 8-inch casing is not practical is in general correct because expansion of the gas that takes place in this large size flow string would dissipate its energy before the fluid could reach the surface.

It further follows that if the fluid you are getting is the result of lowering pressures or reducing temperatures to precipitate the fluid naphtha out of the natural gas, then in the 8-inch flow string, it seems reasonable to assume you would have a precipitation of naphtha but would not be able to carry this fluid to the surface owing to lack of energy in the remaining flow of gas.

In gas wells that make some water it is a common practice to tube them in order that they may discharge or "siphon off" this water which will not flow out with the gas through the full-size flow string. The gas can be discharged through the casinghead connection and if this is shut in for a time pressure will build up in the well sufficiently to discharge the accumulated water through the smaller diameter string of tubing and prevent the well from being drowned out.

Not knowing the shut-in pressure of your well, or the bottom hole pressure, the quantity of fluid being produced, or the volume of gas, various things are assumed here in making the foregoing suggestions. It is believed you can get some practical advice from companies acidizing wells in the Turner Valley Field. If acidizing should be recommended and you acted on the recommendation tubing could then be run if the well still refused to deliver its production through the 8-inch casing.

The question, whether "naphtha" is in fluid or gaseous form in the formation is difficult to answer because the term naphtha is used so loosely that it would be essential to have a careful laboratory analysis made of the mixture that is discharged from the separator before any opinion could be formed as to its probable condition in the formation. It is not essential so far as your problem is concerned because you are dealing primarily with formation energy and you apparently do not have sufficient under present operating conditions to deliver the fluids through the separator.

'How Big Is a Rock?' Not Really Foolish Question After All

I have often heard the facetious question, "How big is a rock?" and I am wondering if there really is any scale of sizes of sedimentary material that might in some measure answer this seemingly foolish question. I know that there are standard screen sizes for the smaller particles and would like to know if there are any similar standards for larger and coarser materials not readily screened.—S. E. D.

Your question is a reasonable one and there is an answer. "Rock," as defined in the dictionary is "a large concreted mass of stony material; also, broken pieces of such masses." The mass would have unlimited dimensions, but the sizes of broken pieces can be expressed in relative terms and C. K. Wentworth has provided the subjoined table of grades for defining rounded fragmentse. F. A. Fernald has suggested that rounded masses of this kind may be covered by a generic term "roundstone" which would include pebbles, cobbles and boulders. Mr. Wentworth's table follows:

Mean diameter — Minus	Plus	Pieces
...	256 mm.	Boulders
256 mm.	64 mm.	Cobbles
64 mm.	4 mm.	Pebbles
4 mm.	2 mm.	Granules
2 mm.	1 mm.	Very coarse sand grains
1 mm.	1/2 mm.	Coarse sand grains
1/2 mm.	1/4 mm.	Medium sand grains
1/4 mm.	1/8 mm.	Fine sand grains
1/8 mm.	1/16 mm.	Very fine sand
1/16 mm.	1/256 mm.	Silt particles
1/256 mm.	.....	Clay particles

The United Bureau of Soils has made the following size classification of soils:

Sediment	Size of particle mm.
Pebbles	Over 10
Gravel	10-1
Coarse	10-2
Fine	2-1
Sand	1-.05
Coarse	1-.5
Medium	5-.25
Fine	.25-.05
Silt	.05-.005
Clay	Under .005

Why Was It Called That?

LIGHT YEAR

The rate at which light travels is a factor in aerial photography, which now has an important place in oil prospecting. It is in astronomy, however, that the light year enters into scientific calculations. Observations by Dr. Harlow Shapley, astronomer at Harvard University, are said to show that beyond the 10,000,000-light-year limit there are no planets; nothing but empty space. A light-year, yardstick of modern astronomy, is the distance light travels in a year, moving at the rate of 186,324 miles a second. Multiplying that distance by the number of seconds in 10,000,000 years gives some idea of how far it is to the outside limit of the planetary universe.

Texas Well Holds the Record for Length of Its Casing String

I read a statement that the record for the longest string of casing was held by the well of the Denver Producing & Refining Co., near Binger, in Caddo County, Oklahoma, in the spring of 1934, but it gave no figures. I am interested in this particular well and would appreciate it if you could tell me the size, length and weight of the casing and any other facts of interest you may have about the drilling of this well. Can you tell me how the Binger well's casing record compares with others? Is the statement that the Binger well holds the record for longest casing string correct?—E. T. T.

The 9,910 feet of 6⅝-inch casing set in the Binger well of the Denver Producing & Refining Co. in March, 1934, was not only the longest string of casing of that size ever set in an oil well up to that time, but the longest of any size. The casing was 26-pound, and its total weight was 267,064 pounds. More than 3,000 sacks of cement were used in setting this pipe. The Binger well's casing record was broken in August, 1934, however, when the Gulf Production Co. ran 10,301 feet of 7⅝-inch casing in its No. 103 McElroy, an Ordovician wildcat test in Upton County, Texas.

In rotary drilling it is possible to drill a great depth without the use of steel casing to shut off the water sands or caving hole. The hole is filled with mud at all times and this material holds the sides of the hole in place. The Binger well hole was drilled with 11¼-inch bit down to 6,252 feet and in this hole 6,238 feet of 9⅝-inch 40-pound casing was set and cemented.

The inside of this pipe permitted the use of an 8⅛-inch bit and the hole below the bottom of this string of casing to the point where drilling was halted preliminary to completing the well was therefore about 8⅛ inches in diameter. The very bottom of the hole was less than 8⅛ inches because it was drilled with 7¼-inch bit and then the last 13 feet cored with 2½-inch corecutter head. This lower portion of the hole was redrilled when the cement had set back of the long string of 6⅝-inch casing run into the hole.

All of the hole below 3,820 feet is in the Pennsylvania formations. When the drill had penetrated the last 70 feet of these formations below 9,900 feet oil and gas in commercial quantities were found and it was decided to set a string of 6⅝-inch 26-pound casing to serve as a flow string and protect the walls of the hole when the well should be put on production. This string of 6⅝-inch casing was actually 10,040 feet 11 inches long, tape line measurement end to end of joints, but when made up and run into the well the bottom of the pipe was estimated to be 9,921 feet 3 inches below the spider on the derrick floor.

Some other casing records which attracted interest in their time include: Peoples Natural Gas Co., Ligonier, Pa., 6,794 feet of 4-inch, 23-pound casing (cable-tool well); North American Oil Consolidated, North Dome of Kettleman Hills, California, 6,763 feet of 13⅜-inch, 68-pound casing; same well, 8,483 feet of 9⅝-inch casing; Associated Oil Co., Ventura Avenue Field, California, 6,280 feet of 11¾-inch casing; Texon Oil & Land Co., Big Lake Field, Texas, 6,184 feet of 5⅛-inch casing.

NATURAL GAS DEVELOPMENTS

Rail Commission Report on United Gas System

AUSTIN, Tex., Oct. 22.—Ernest O. Thompson, member of the Texas Railroad Commission, has announced completion by the gas utilities division of an exhaustive examination of the corporate structure and financial history of the United Gas Public Service Co. and its subsidiary and underlying companies. The company and its affiliates constitute the "United Gas System," serving as principal cities Pensacola, Fla.; Mobile, Ala.; Jackson and Gulfport, Miss.; New Orleans, Shreveport, Monroe, Lake Charles, Lafayette and Franklin, La.; Houston, San Antonio, Dallas, Fort Worth, Beaumont, Austin, Marshall, Port Arthur, Orange, Wichita Falls and Laredo, Tex.; and Monterrey, Mexico. As of December 31, 1933, book value of its fixed capital, not including investments in affiliated companies, was $156,185,651.

The report showed these totals for the United Gas System, including the subsidiaries of the U.G.P.S. Co.:

	1933	1932	1931
Population served	2,333,000	2,323,000	2,310,000
Customers served direct	110,813	106,689	102,672
Natural gas produced and purchased, M feet	161,393,703	164,417,905	176,419,079
Natural gas sold, M feet	147,872,137	148,636,212	154,719,835
Gasoline produced, gallons	19,721,172	23,318,411	22,623,568
Oil produced, barrels	1,111,574	2,109,857	4,201,811

As affiliates or subsidiaries of United Gas Public Service Co., the report showed these:

Desiard Development Co. Inc., with book value, December 31, 1933, of $10,000, fixed capital. Southern Gas & Fuel Co., Fla., with book value, $6,062,231, fixed capital. Terrebonne Gas Co., Inc., La., book value of fixed capital at $1,466,246. Northern Texas Utilities Co., Del., book value of fixed capital, $9,065,669. United Production Corp., Del., book value of capital, $23,137,880. Cia. Mexicana de Gas, S.A., Monterrey, book value of fixed capital, $2,696,960. Motor Fuel Products Co., Texas, fixed capital, $500,381. Houston Gulf Gas Co., book value of fixed capital, exclusive of investments in affiliates, at December 31, 1933, was $20,960,561. Houston Gas & Fuel Co., Texas, book value of fixed capital, $11,853,740. Southern Gas Co., Del., fixed capital, $13,648,595. Southern Gas Utilities, Inc., Del., fixed capital, $3,646,123.

Following companies were dissolved or merged into the present system: Dixie Gas & Fuel Co., dissolved; Dixie Gas & Utilities Co., merged; Dixie Gulf Gas Co., dissolved; Excelsior Pipe Line Co., dissolved; Greenwood Production Co., dissolved; Industrial Gas Co., dissolved; Louisiana Gas Co., dissolved; Louisiana Gas & Fuel Co., dissolved; Moody-Seagraves Gas Co., Inc., dissolved; Moran Gas Corp., dissolved; Northern Louisiana Natural Gas Co., dissolved; Ouachita Natural Gas Co., dissolved; Palmer Corp. of Louisiana, inactive; Panola Oil & Gas Co., dissolved; Port Arthur Pipe Line Co., dissolved; Richland Production Co., dissolved; Robstown Gas Co., dissolved; Robstown Pipe Line Co., dissolved; Seagraves Gas Co., dissolved; Sinton Gas Co., dissolved; Sinton Pipe Line Co., dissolved; Southern States Gas Co., dissolved; South Texas Gas Co., dissolved; South Texas Production Co., dissolved; Southwest Distributing Co., dissolved; State Line Oil & Gas Co., Inc., dissolved; Texas Border Gas Co., dissolved; Texas-Louisiana Pipe Line Corp., dissolved; Texas-Louisiana Production Corp., dissolved; Union Producing Co., dissolved; United Gas Co., merged; United Gas Engineering Co., dissolved; Western Gas & Fuel Co., dissolved.

December 31, 1933, the system controlled reserves in 40 fields, principally as follows: Monroe, Richland and Floyd Fields in northeastern Louisiana; Sugar Creek, Sligo and Rodessa in northwestern Louisiana; Jackson Field in Mississippi; Bethany, Waskon and Van Fields in northeastern Texas; Amarillo Field in northwestern Texas; Jenning, Carolina-Texas, Cole-Bruni and Government Wells Fields in the Laredo district; Agua Dulce, Sandia, Saxet, White Point, Refugio, Fox and McFaddin in the Texas Gulf coastal area, and La Presa in Tamaulipas, Mexico.

Approximately 1,319,999 acres are owned by the system in fee, held under lease or covered by gas purchase contracts, of which 211,000 acres are located in proven areas, the report said. The system includes 941 miles of field lines and 4,889 miles of main pipe lines for gathering and transporting gas to markets, and 3,093 miles of distribution lines for direct service to customers.

In 1932, of the total operating revenues of the system, approximately 91 per cent was derived from natural gas sales as compared with 93 per cent in 1933. There was a decrease of one-half of 1 per cent in the total volume and a decrease of approximately 7 per cent in operating revenues from natural gas sales for 1933 under 1932, due to a decrease of slightly less than 1 cent per 1,000 cubic feet in the average price received in 1933 as compared with 1932.

TABER GAS SERVICE

TABER, Alberta, Oct. 20.—The Canadian Western Natural Gas, Light, Heat & Power Co. of Calgary has arranged to supply natural gas to the Taber canning factory.

Oklahoma Court Denies Appeals of Lone Star

The Oklahoma Supreme Court denied petitions for rehearing in two appeals of the Lone Star Gas Co. from rate reduction orders of the Oklahoma Corporation Commission.

"The decision leaves the next move up to the gas company," said Holmes Baldridge, commission attorney. "Under the supreme court's decision in the cases, the company either can bring certain records of its Pittsburgh holding company before the commission for inspection or put into effect the reduced rate ordered March 9, 1933."

At that time the commission directed the gas company to cut rates from 75 to 65 cents per 1,000 feet in 26 Oklahoma towns. A bond was posted by the company pending appeal.

CLEVELAND, OHIO, RATE

CLEVELAND, Ohio, Oct. 20.—The East Ohio Gas Co. has agreed to the gas rate set by Cleveland council and upheld by the Ohio Public Utilities Commission, which has been in controversy since July, 1928. The company will pay a $4,000,000 rebate to customers. The new schedule provides an average rate of 57.15 cents per 1,000 feet, against 64.85 cents. The 50 cents a month service charge is eliminated and a minimum of 75 cents a month substituted.

LONDON GAS PROPOSITION

LONDON, Ontario, Oct. 20.—A delegation appointed by the London city council and comprising Mayor George Wenige, City Clerk Crawford, City Engineer Veitch and Alderman McLeod, is making a tour of natural gas municipalities in southwestern Ontario, to secure information in connection with the recent application of the City Gas Co. for a franchise to supply natural gas to London. The City Gas Co. is a subsidiary of the Union Gas Co. of Chatham and it is proposed to pipe natural gas to London from the Dawn Field in Lambton County, a distance of 55 miles. It is probable that the proposition will be submitted to the London ratepayers at the municipal election in December.

RECORD IN GAS COMBUSTION

Complete combustion at the rate of 8,700,000 B.t.u.'s per hour per cubic foot of combustion space has been found possible in tests made at the A.G.A. Testing Laboratory, thus demonstrating the applicability of gas to industrial processes in a manner not heretofore deemed possible. This enormous concentration of combustion reactions was attained with manufactured gas burning in a short cylindrical chamber with only 6.2 per cent excess oxygen, no carbon monoxide or hydrogen being produced.

Although the volume of gas burned per cubic foot of combustion space in the laboratory's tests represents millions of B.t.u.'s more than has been generally thought possible, it is not considered as the ultimate limit attainable.

THAMESVILLE FRANCHISE

THAMESVILLE, Ontario, Oct. 20.—Ratepayers of Thamesville defeated a proposed natural gas franchise to the Union Gas Co. of Chatham. The company installed the gas service in 1930 pending franchise arrangements, and will continue the service. A rate agreement between the company and the town council was signed some weeks ago.

EDMONTON GAS RATE

EDMONTON, Alberta, Oct. 20.—The Edmonton city council has accepted the new optional gas rate schedule for commercial and industrial consumers recently offered by Northwestern Utilities, Ltd. The company estimates the new schedule will save such consumers approximately 10 per cent.

NATURAL GAS PRODUCED AND CONSUMED IN THE UNITED STATES IN 1932, BY STATES

State—	Produced and delivered to consumers, including deliveries in other states: Quantity M cu. ft.	Quantity: Per cent of total	Estimated value at the wells: Total	Estimated value at the wells: Aver. per M cu. ft. (cents)	Value at points of consumption: Total	Value at points of consumption: Aver. per M cu. ft. (cents)	Consumed, including receipts from other states: Quantity M cu. ft.	Quantity: Per cent of total	Value at points of consumption: Total	Value at points of consumption: Aver. per M cu. ft. (cents)
Alabama	.....	....	.....	.....	.....	.. ..	5,827,000	0.4	1,964,000	33.7
Alaska	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Arizona	.....	....	.....	.....	.....	.. ..	2,274,000	.1	541,000	23.8
Arkansas	10,235,000	0.6	521,000	5.1	2,242,000	21 9	25,330,000	1.6	5,548,000	21.9
California	263,484,000	16.9	17,126,000	6.5	73,172,000	27.8	263,484,000	16.9	73,172,000	27.8
Colorado	2,547,000	.2	67,000	2.6	757,000	29.7	16,409,000	1.1	6,236,000	38.0
District of Columbia	.. .. ..	.....	.....	.....	.. ..	.....	1,688,000	.1	1,442,000	85.4
Florida	.....	.....	.....	.....	.....	.....	618,000	(†)	203,000	32.8
Georgia	.....	.....	.....	.....	.....	.. ..	3,947,000	.2	2,935,000	74 4
Illinois	1,769,000	.1	144,000	8.1	1,016,000	57.4	29,432,000	1.9	30,559,000	103.8
Indiana	1,349,000	.1	386,000	28.6	842,000	62 4	11,651,000	.7	3,850,000	32.0
Iowa	.....	.....	.....	.....	.....	.....	7,533,000	.5	2,413,000	32.0
Kansas	40,690,000	2.6	3,048,000	7 5	13,420,000	33.0	56,965,000	3.7	16,468,000	28.9
Kentucky	29,005,000	1.9	4,037,000	13.9	13,551,000	46.7	13,698,000	.9	6,067,000	44.3
Louisiana	201,561,000	12.9	6,127,000	3.0	36,992,000	18 4	113,215,000	7.3	12,771,000	11 3
Maryland	.....	.. ..	.....	.....	.....	.....	639,000	(†)	547,000	85.6
Michigan	968,000	.1	124,000	12.8	262,000	27.1	968,000	.1	262,000	27.1
Minnesota	.....	.....	.....	.....	.....	..	(‡)	(‡)	(‡)	(‡)
Mississippi	8,648,000	.5	380,000	4.4	2,324,000	26.9	5,762,000	.4	1,806,000	31.3
Missouri	932,000	.1	79,000	8 5	502,000	53.9	25,310,000	1.6	11,968,000	47.3
Montana	13,295,000	.8	560,000	4.2	4,359,000	32.8	§11,100,000	.7	3,359,000	30.3
Nebraska	.....	.....	.. ..	.....	.....	.. ..	8,661,000	.6	3,094,000	35 7
New Mexico	17,604,000	1 1	364,000	2.1	2,448,000	13.9	11,880,000	.8	1,463,000	12.3
New York	‖8,813,000	.6	2,613,000	29.6	6,124,000	69.5	16,724,000	1.1	11,626,000	69 5
North Dakota	.....	.....	.....	.....	.....	.....	‡2,133,000	‡.1	‡708,000	‡33.2
Ohio	51,466,000	3.3	8,698,000	16.9	28,640,000	55.6	94,414,000	6.1	52,595,000	55.7
Oklahoma	255,487,000	16 4	9,862,000	3.9	28,108,000	11.0	246,741,000	15.9	22,082,000	8.9
Pennsylvania	‖61,611,000	4.0	15,403,000	25.0	32,080,000	52 1	76,935,000	4.9	37,951,000	49 3
South Dakota	10,000	(†)	700	7 0	4,000	40.0	2,776,000	.2	1,124,000	40.5
Tennessee	22,000	(†)	3,300	15.0	8,000	36 4	7,683,000	.5	2,863,000	37.3
Texas	**456,832,000	29.4	9,868,000	2.2	89,066,000	19.5	414,644,000	26.7	50,326,000	12.1
Utah	*184,000	(*†)	*12,000	*6 5	*94,000	*51.1	*5,721,000	*.4	*1,665,000	*29.1
Virginia	.....	.....	.....	.. ..	.....	.....	143,000	(†)	155,000	108.4
Washington	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
West Virginia	100,540,000	6 5	18,830,000	18.5	44,557,000	44.3	46,281,000	3 0	13,949,000	30.1
Wyoming	28,938,000	1.9	932,000	3.2	4,064,000	14 0	23,749,000	1.5	2,411,000	10.2
Total 1932	1,555,990,000	100.0	98,985,000	6.4	384,632,000	24.7	1,554,235,000	100.0	384,123,000	24.7
Total 1931	1,686,436,000	100.0	117,505,000	7.0	392,816,000	23 3	1,684,249,000	100.0	392,156,000	23.3

*Utah includes Alaska and Washington. †Less than 0.1 per cent. ‡North Dakota includes Minnesota. §Includes 28,000,000 cubic feet piped from Canada. ‖Includes 46,000,000 cubic feet piped to Canada ¶Includes 27,000,000 cubic feet piped to Canada. **Includes 1,610,000,000 cubic feet piped to Mexico.

PERSONAL PARAGRAPHS

LIEUT.-COL. S. J. M. AULD, O.B.E., D.Sc., has been appointed chief technologist of the Vacuum Oil Company, Ltd.

* * *

MISS VERNA GARVIN, holding a secretarial office in the U. S. Geological Survey at Casper, Wyo., left for a visit with her mother and other relatives in Florida.

* * *

MAX W. BALL, of Denver, Colo., geologist and petroleum engineer, is spending several weeks in Alberta, Canada, where he is checking some work for Canadian and British interests.

* * *

CECIL E. KEEP, formerly petroleum engineer with Attock Oil Company, is joining the British Burma Petroleum Company at Yenangyuang on the expiration of his vacation in England.

* * *

J. P. GORDON, president, and H. A. HEGELHEIMER, treasurer of the Gordon Oil Company, both of Columbus, Ohio, were visitors at the company's Mount Pleasant, Mich., office recently.

* * *

WILLIAM J. KEMNITZER, petroleum technologist and co-author of "Petroleum in the United States and Possessions," is engaged in preparing a new book at the California Institute of Technology, Pasadena, entitled "Economics of the Petroleum Industry."

* * *

DR. HERMAN von SCHRENK, consulting timber engineer, St. Louis, Mo., and senior vice president of the American Society for Testing Materials, has been elected president of the society. A. C. FIELDNER, chief engineer, Experiment Stations Division, U. S. Bureau of Mines, Washington, D. C., has been elected junior vice president.

* * *

BEN DEAN, of Olean, N. Y., is visiting Chatham and other points in southwestern Ontario.

* * *

R. C. GWILLIAM, counsel for the Marathon Oil Company, Tulsa, visited Fort Worth, Tex., on company business.

* * *

W. W. FLEMING, president of the Marathon Oil Company, Tulsa, has returned from a short business trip to Wichita, Kans.

* * *

JOE RINSINGER, safety director of the Magnolia Petroleum Company, is visiting the Magnolia properties in Oklahoma.

* * *

E. C. MORIARTY, vice president of the Derby Oil Company, Wichita, Kans., was a Tulsa visitor during the past week.

* * *

JOHN H. WILSON, president of the Wilson Manufacturing Company, Wichita Falls, Tex., is visiting Washington, D. C.

* * *

D. ASHBY FELTON, managing director, Foamite Firefoam, Ltd., London, England, is now on a visit to the United States and Canada.

* * *

C. A. BOLER, president of the Boler Petroleum Company, of Philadelphia, Pa., arrived in London, England, in the course of a general European visit.

* * *

EARL SIMPSON, of the Shell Petroleum Corporation operating division, and MRS. SIMPSON motored to Miami, Fla., to attend the national conventions of the American Legion and 40 and 8 during the coming week.

A. SLAYTER, of Laramie, has been appointed Wyoming agent for Manning & Tery, Inc., drilling contractors, Tulsa.

* * *

A. R. WILSON, of Denver, Colo., manager of the Rocky Mountain division for the Texas Company, was in Casper, Wyo., last week.

* * *

WALTER C. PEW, Sun Oil Company, Philadelphia, Pa., and JACOB BLAUSTEIN, American Oil Company, Baltimore, Md., have been added to the Regional Labor Committee.

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S. M. COHN, Independent Oil Company, Altoona, Pa., and HARVEY REMINGTON, Reading, Pa. have been named on the Pennsylvania-Delaware State Petroleum Committee. WILLIAM F. SWAVELY retires.

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ERNEST HALL will have charge of drilling operations for the wildcat test of the Argo Oil Company at O'Brien Springs, Carbon County, Wyoming. Mr. and Mrs. Hall will make their home at Rawlins until the well is completed.

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MISS GERTRUDE CONVERSE has returned to Casper, Wyo., after an extended sojourn in California. Miss Converse was formerly secretary to GEORGE H. JACQUES, general superintendent of the Stanolind Oil & Gas Company.

* * *

ROBERT CURTIS McNAUGHTON, of Tulsa, sales supervisor, Shell Petroleum Corporation, was married to MISS MILDRED ADCOCK in the parsonage of the First Baptist Church of Kansas City, Mo., on September 29. They are now at home at the Mae Rose Apartments, Twelfth and Denver, Tulsa.

R. D. JORDAN, Skelly Oil Company, Chicago, has succeeded E. F. UNDERWOOD on the Wisconsin State Petroleum Committee.

* * *

C. S. RITCHIE, Continental Oil Company, Washington, D. C., has been named on the District of Columbia Petroleum Committee, succeeding E. A. LETZKUS.

* * *

SIR JOHN CADMAN, G.C.M.G., D.Sc., has been appointed a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

* * *

WALTER WYKOFF, Mount Pleasant, Mich., office manager of the Gordon Oil Company, attended the recent meeting of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers.

* * *

H. E. (HANK) ZOLLER, of the Shell Petroleum Corporation exploitation engineering department, made a business trip to the Texas Panhandle area accompanied by G. T. MOIR, Shell production department, St. Louis, Mo.

* * *

F. E. McFARLAND, of the office manager's department, Shell Petroleum Corporation, delayed his vacation until the past week. He went to St. Louis, Mo. R. B. KERR, of the St. Louis offices, was a Tulsa visitor during the week.

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W. B. OSBORN, FRANK FLEET and R. W. SIMPSON, Ada, Okla., oil men, recently purchased 85 acres of land in Johnston County from JOHN FITTS and J. E. ROBERTS and presented the tract to the Ada Boy Scouts for a camp site.

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O. F. HEDRICK, geologist for the Texas Pacific Coal & Oil Company, has been transferred from Thurber to Midland, Tex.

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W. W. CLAWSON, assistant chief geologist of the Magnolia Petroleum Company, Dallas, Tex., is vacationing in Lawrence, Kans.

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HOWARD N. EAVENSON, national president of the A.I.M.E., was in Los Angeles, Calif., recently to attend the Institute's fall meeting.

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O. J. TUTTLE, sales manager of the Empire Oil & Refining Company, Tulsa, visited the New York offices of the Cities Service Company last week.

* * *

S. A. THOMPSON, chief geologist of the Magnolia Petroleum Company, Dallas, Tex., has just returned to headquarters after a business trip into Mexico.

* * *

CHARLES W. STANLEY, general counsel and director of the Texas Company, addressed the Foreign Club of Los Angeles, Calif., a few days ago at a general meeting.

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J. E. (JOHNNY) FRANEY was appointed to succeed M. J. CROWLEY, deceased, as secretary and treasurer of Western Gas Company, subsidiary of El Paso Natural Gas Company.

* * *

LANIE FINLEY, formerly in the drafting department of the Sinclair Prairie Oil Company, Fort Worth, Tex., has resigned to take a position with the Pure Oil Company in the same city.

DO YOU REMEMBER?

From The Oil and Gas Journal Files

25 Years Ago

October 25, 1909

P. J. White, of the Oil Well Supply Co., thinks Okmulgee, Okla., is becoming important enough to warrant a branch store and is considering a site in the Okmulgee State Bank Building.

The Paw Paw Gas Co. has been organized with a capital of $3,000,000 and will lay a gas line from the Caney gas field north of Bartlesville to smelters at the zinc mines near Miami, Okla.

J. E. Crosbie, of Tulsa, trades the famous Jacob Anderson lease in the Glenn Pool for the spacious residence and grounds of W. H. Roeser at Main and Fifteenth Streets in Tulsa. It was an even trade on a $60,000 valuation for each property.

20 Years Ago

October 22, 1914

The Royal Dutch-Shell organization is reported to have invested $26,000,000 in oil properties in California.

A. W. Heggem, of the U. S. Bureau of Mines, shuts off a 60,000,000-foot gas production in the Wheeler sand in the Cushing Field, in Oklahoma, permitting the completion of a well that has been a year in drilling to the Bartlesville sand. Mud-laden fluid was used to shut off the gas. This method is new to Cushing operators.

The Lakeview gusher after producing wide open for several months producing over 6,000,000 bbls., is still pouring out 17,000 bbls. of oil per day.

W. H. D. Chapin, pioneer oil operator in the Pennsylvania Grade fields, dies in Parkersburg, W. Va.

10 Years Ago

October 23, 1924

The 82,000-mile pipe line system in the United States represents an investment of $750,000,000.

Mr. and Mrs. Alf Webb, after 14 years in the Sarawak, Borneo, oil fields, are on their way to Petrolia, Ontario.

French chemists working on a synthetic gasoline say they will have it ready for the market by 1929!

The Penn American Refining Co. has been merged into the Pennzoil Co., with C. L. Suhr of Oil City, Pa., at the head.

JAMES S. McLISTER, of Guayaquil, Ecuador, who has been spending several months with his son at Sandwich, Ontario, sailed on October 13 from New York on the Steamship Santa Maria.

* * *

DR. R. K. STRATFORD, chief chemist for Imperial Oil Refineries, Ltd., has returned to Sarnia, Ontario, from a six weeks' trip to France where he acted in an advisory capacity in connection with the construction of a new refinery.

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S. S. RODGERS, president of the Texas Company, arrived in Los Angeles, Calif., for a brief visit. He made the trip from New York by water and will spend about a week in San Francisco before returning to the eastern metropolis.

* * *

M. G. McGRATH and G. J. LePINE, formerly of the American Petroleum Company, Chicago, have established the Trans-American Petroleum Corporation, with headquarters in the Straus Building, Chicago, and will do a general petroleum products marketing business.

* * *

ARCH M. BOWMAN, formerly purchasing agent for the Humble Oil & Refining Company, Houston, Tex., and more recently with Parkersburg Rig & Reel Company, has formed a sales agency with headquarters in Tulsa, handling equipment made principally in Tulsa.

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JOHN W. MASHAW, who was with the Bureau of Mines for several years and subsequently with the Associated Oil Company at San Francisco, Calif., is making his headquarters with the Kettleman North Dome Association in Los Angeles since entering Kenda's employ a short time ago.

* * *

JAMES BURNESS, agent of the Canadian Western Natural Gas, Light, Heat & Power Company at Foremost, Alberta, has been transferred to the company's office at Brooks, Alberta. He is being succeeded at Foremost by JAMES MORRISON, widely known for his connection with baseball activities in western Canada.

* * *

WILLIAM G. LANE, Lane Wells Company, Los Angeles, Calif., is in Tulsa on business this week.

* * *

V. C. FULLER, purchasing agent, Gypsy Oil Company, has been in Hobbs, N. Mex., on company business.

* * *

G. H. SCHLATTER, formerly secretary-treasurer of the Southern Gas Association, has been appointed promotion manager of the Iroquois Gas Corporation at Buffalo, N. Y.

* * *

CHARLES GOLDRING and JOHN G. WHITFIELD, of the International Petroleum Company, Ltd., Toronto, Canada, arrived in New York City last week on the Grace liner, Santa Cecilia.

* * *

P. G. EVERSON, American Oil Company, Providence, and CHARLES W. REGAN, Goodrich Oil Company, Providence, have been named on the Rhode Island State Petroleum Committee, succeeding G. R. TORBORG and OSCAR O. GOODRICH.

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E. H. EDDLEMAN, for the Production Subcommittee of the Planning and Coordination Committee, has recommended the following changes in the Texas Drilling Practices Committee, Region No. 4: D. T. GARDNER, Gardner Brothers, Wichita Falls, Tex., is substituted for GEORGE B. CREE, Cree & Hoover, Amarillo, Tex., who is retiring; and D. B. Collins, Shell Petroleum Corporation, Houston, is substituted for G. R. HENSON, Shell Petroleum Corporation, Houston, Tex., who is retiring.

Proud He Started on "Shoestring"

E. B. Coolidge, active in oil and gas development in Montana and Wyoming, started on a shoestring and doesn't care who knows it. Born in Columbus, Neb., in 1884, he didn't let hard conditions in boyhood bother him. He worked his way through the South Dakota School of Mines in Rapid City, graduating with a B.S. in mining engineering in 1906, and received an E.M. in 1908.

E. B. COOLIDGE

Upon his graduation Mr. Coolidge went to Cooke City, Mont., where he ran an assay office until 1909. In that year he went to Kendall and Jardine, Mont., and started leasing and developing old mines for his own account. In 1920, following the discovery of oil in the Cat Creek Field, Mr. Coolidge organized the Montacal Oil Company, which operated successfully before selling its properties, and the Homestake Oil Company, one of the most successful operating companies in the Cat Creek Field, and the largest individual producer there from original holdings.

When the Kevin-Sunburst (Montana) Field was discovered, in 1922, Mr. Coolidge became active in acquiring leases and the development of that territory. He organized the Homestake Exploration Corporation, which afterwards sold out to the Texas Pacific Coal & Oil Company profitably, and the Hardrock Oil Company, which is still operating in Montana territory. He also operated for a time in Wyoming and he engaged in the development, piping and sale of natural gas. He organized the Montana Gas Corporation, which produces gas in the Bowes (Montana) Field and sells it to distributing companies in Havre and Chinook. He acquired and successfully directed the Treasure State Pipe Line Company and the Consumers Gas Company. He engaged in the drilling contracting business, founding the C C Operating Company with Lon Crumley, a well-known old-time driller, and Coolidge & Coolidge, Inc. All of the companies mentioned have been successful.

Mr. Coolidge was president of the Montana Oil and Gas Association in 1926; has long been a director of the Rocky Mountain Oil and Gas Association; is a member of the Regional Production Committee under the National Petroleum Code Administration, and, early in 1934, was appointed by Governor Cooney chairman of the Oil Conservation Board of Montana. He resides in Great Falls, Mont.

T. D. NESBIT, sales manager, Erie Meter System, Erie, Pa., called on representatives of marketing divisions of oil companies in the Mid-Continent area.

* * *

H. P. TAUBMAN, president of the Taubman Supply Corporation, Tulsa, is making a trip through Texas, calling on all his branches as well as the trade in connection with his program of expansion.

* * *

CHESTER N. CHUBB, of Chicago, vice president of the American Light & Traction Company, and president of the Muskegon Gas and American-Michigan Pipe Line Companies, Muskegon subsidiaries, attended a meeting of the two companies in Muskegon last week at which officials discussed the progress of the new natural gas pipe line being laid between Muskegon and the Austin Township, Mecosta County, gas field.

* * *

J. W. STEELE has retired from the oil administration to accept a position as secretary of the Production and Transportation Subcommittees of the Planning and Coordination Committee. As chairman of the Technical Advisory Committee of the Petroleum Administrative Board, he has served as an alternate member of the board and as alternate chief of the Production Division of the board in the absences of E. B. SWANSON, chief of the division. Mr. Steele went to the board from the Geological Survey, with which he had been connected for several years in Roswell, N. Mex., Wyoming and other Rocky Mountain states.

E. B. REDPATH, of Findlay, Ohio, director and secretary of the Ohio Oil Company, was a visitor at the offices of the Marathon Oil Company in Tulsa during the past week.

* * *

JOSEPH B. ELAM, Shreveport, La., secretary of the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association, has been seriously ill in a Shreveport hospital, suffering from a complication of ailments, but is reported improved.

* * *

LOREN J. BERRY, associated with Thiesen-Clemens Company, St. Joseph, Mich., was in Tulsa on business the past week. He formerly was employed in the accounting department of the Mid-Continent Petroleum Corporation in Tulsa.

* * *

JACOB FRANCE, president of Mid-Continent Petroleum Corporation, is in Tulsa on one of his periodic visits. He planned to make several inspection trips to the company's properties in Oklahoma and Texas while in the Southwest.

* * *

J. G. DUNN and B. W. SNYDER, of Calgary, and WILLIAM CROOKER and JAMES MORRISON, of Burdett, visited Lethbridge, Alberta, recently in connection with the operation of the Canadian Western Natural Gas, Light, Heat & Power Company there.

* * *

DAVID DONOGHUE, Fort Worth, Tex., consulting geologist, and PAT HILL, vice president and general manager of the Rector Oil Company, spent several days the past week looking after business interests in Midland, the West Texas Permian Basin and eastern New Mexico.

* * *

LEON J. PEPPERBERG, consulting geologist of Dallas, Tex., has been elected chairman of the Dallas Petroleum Geologists for the year, succeeding F. E. HEATH of the Sun Oil Company. H. J. HAWLEY, assistant division manager of the California Company, was elected vice chairman and CHARLES B. CARPENTER, JR., of the Bureau of Mines, was re-elected secretary-treasurer.

* * *

JIM SARGENT, formerly of Sinclair Refining Company, is now with Shell Petroleum Corporation, at Lucien, Okla.

* * *

E. I. HANLON, chairman of the board, and A. E. BRADSHAW, of the National Bank of Tulsa, are in the East attending the American Bankers Association being held in Washington, D. C.

* * *

TED R. MILLER, Southwest Texas representative for Taubman Supply Corporation, Tulsa, has been placed in charge of the Ada and Seminole, Oklahoma, districts, with headquarters at Ada, Okla.

* * *

P. J. HOFFMASTER, former superintendent of state parks in Michigan, has been named state director of conservation, in succession to the late COL. GEORGE R. HOGARTH, who held that position since the oil and gas industry assumed importance in Michigan.

* * *

WILLIAM ARTHUR TURNER, F.C.I.S., after 36 years in the oil business and 23 years with the Shell group, has retired. In doing so, he relinquishes the secretaryship of the following companies in the group: Anglo-Egyptian Oilfields, Grozny-Sundja Oil Fields, New Schibaieff Petroleum Company, North Caucasian Oil Field, United British Oilfields of Trinidad, Ural Caspian Oil Corporation and Venezuelan Oil Concessions, as well as the London and National Property Company, Ltd. J. H. FRENCH has been appointed secretary in Mr. Turner's place.

Form of Clay Factor in Study of Drilling Fluids

(Continued from Page 18)

beautifully illustrated by the data of Figure 8 which shows the influence on the yield point of an acidic china clay of additions of sodium sulphate and calcium chloride respectively. The yield point is greatly depressed by the sodium sulphate, at first rapidly and then more slowly and reduced to a lesser degree by the calcium chloride. The diagram also indicates the corresponding changes in pH, though these are not sufficient to be significant.

The influence of ferric chloride is shown in Figure 7; this is unfortunately on another clay of low initial yield point, but it is seen that the trivalent salt produces initially a very great increase in yield point, which then goes through a maximum, but the lowest value attained is still far higher than that of the original clay. Study of the data would indicate that, while monovalent metal greatly reduces the intensity of the surface attractive forces, divalent metal also reduces it, though to a lesser degree. Trivalent metal, on the other hand, apparently increases the attraction, although it is not known what metals were initially on the surface of the particles of the clay of Figure 7. Effects of this sort, due to the complicated phenomena of base exchange which are always occurring when a clay is brought into contact with salt solutions, are undoubtedly of extraordinary importance, but all too little is known about them. They have apparently not been studied systematically in the light of an adequate understanding of the mechanism involved. Thus, the velocities of base exchange are often extremely low, and changes in properties otherwise unsuspected will escape notice unless this factor is kept in mind.

Surface Characteristics

The character of the surface of the particle can be profoundly influenced in other ways. Thus, a clay whose yield point has been brought down by adjusting the pH to a value of 11, can be still further reduced by the addition of tannic acid (see Figure 6). The mechanism of this effect has not been demonstrated. It may be due in part to the conversion of a calcium or magnesium clay to a sodium type of precipitation of the alkaline metal as tannate. It seems probable that a more important factor is the absorption of tannic acid on the surface of a clay particle as a protective colloid. It is not improbable that the mechanism of this absorption is the combination of the tannic acid with the clay surface through a bridge of divalent metal ion.

Whatever the mechanism of absorption, the protective colloid on the surface greatly reduces the effect of the attractive forces, and consequently the tendency to particle adhesion, resulting in almost complete disappearance of yield point. An entirely similar effect is shown by phosphoric acid, but the pH of maximum effectiveness of this addition agent is about 6.5, far lower than the corresponding value for tannic acid. Furthermore, with most clays the maximum result is secured only when the phosphoric acid is added, at still lower pH values and the pH then adjusted by adding alkali. The mechanism is probably analogous to that in the case of tannic acid. That the tannic acid does not function primarily as a high molecular weight colloid is indicated by the high pH required to make it effective. In these strongly alkaline solutions tannic acid exists largely in the ionic state and with relatively low molecular weight; at low values of pH, where this acid exists as a colloid of high molecular weight, it is ineffective in modifying the mobility and yield point characteristics of clay (Figure 6).

Clay Characteristics

The preceding discussion has dealt mainly with the influence of modification of conditions on the characteristics of a given clay. All too little is known of the causes of the extraordinary differences between different clays. Undoubtedly, particle size is a major factor, the finer the particle the more plastic the clay, but it seems impossible to ascribe all the differences to this single cause.

The silica-alumina ratio is probably a factor, the indications being that the highly silicious clays are the more colloidal, perhaps due to a more outstanding acidic character. As already indicated, it may well be that some clays, perhaps even clays relatively high in silica, have surface layers which are predominantly alumina. This should, of course, depress the acidity of the clay and render it more inert. Particle shape may be an important factor. Thus, the fact that ground quartz shows no yield point is probably due to roughly cubical particles, which can have relatively small mutual areas of contact. Mica, with its cleavage planes, gives a considerably greater yield point (Figure 1). Even ground silica gel, in contradistinction to ground quartz, shows a decided yield point; in view of its method of formation and its properties one would expect it to have a large surface area which should still persist in some degree even in the ground material.

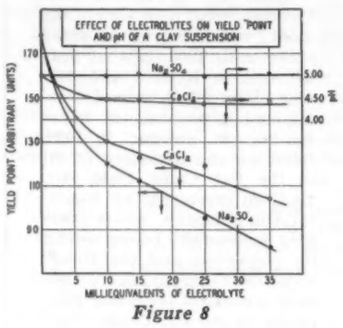

Figure 8

It is not impossible that the particles of some clays are decidedly rounded so that they touch in suspension predominantly in point rather than surface contacts, whereas others with the plate shape highly developed have the corresponding possibility of forming large, stable agglomerates. The data indicate that the finer clays gel more slowly but develop stronger structures, in keeping with the explanations here offered. The small particles are attracted by relatively weak forces which, until the particles have finally located themselves face to face, are opposed by the Brownian vibrations induced by the impacts of solute molecules. A considerable time interval is therefore required for the final development of agglomerate structure. Larger particles, because of the larger surface areas available, are attracted by larger forces and the interference to the associating action of these forces by Brownian vibration is a minimum. However, thoroughgoing experimental investigation of all these factors is extremely desirable.

While the characteristics of clay muds can be understood only in the light of a thorough appreciation of their behavior as colloids, a word of warning is necessary against the danger of drawing unjustifiable comparisons between the clays and many other colloidal materials. Thus, there are striking parallelisms between clay suspensions and gelatin solutions. Both are colloidal. Both exhibit Brownian movement. Both are highly viscous. Both set under proper conditions to strong and stable gels. The colloidal properties of both are profoundly influenced by the hydrogen ion concentration (pH), showing in each case marked maxima and minima at definite pH values. The two are similarly affected by electrolytes, though in different degrees. Despite these parallelisms, the differences are fundamental. The outstanding distinction between the two types is found in the fact that in low concentrations, materials of the clay type have high and those of the gelatin type may have low mobility, relative to the fluidity of the solvent.

Again, while gelatin is water-soluble, it is highly resistant to most organic solvents. It is completely unaffected by hydrocarbon liquids, and is precipitated from aqueous solutions by alcohol and similar organic solvents miscible in water. The addition of small amounts of these precipitants results in a marked decrease in viscosity of the gelatin solution. Clay, on the other hand, is plasticized not only by the water but by these very organic solvents which precipitate gelatin (see Figure 4). Indeed, using yield point as a measure of plasticization, the organic liquids are more effective than water itself. Furthermore, it is possible to reduce the yield point of a clay suspension to a negligible value (e.g., by treatment with tannic acid at suitable pH), but such treatment changes the mobility but little, (see Figure 3), and the viscosity of the suspension is influenced but slightly by the method of breaking the yield point by other conditions, so long as the yield point is low. Gelatin solutions also show a yield point under proper conditions and furthermore this yield point can be reduced to a negligible value, e.g., either by agitation or rise in temperature. However, here the analogy ends, because there is a large change in mobility with drop in yield point and the viscosities of solutions of zero yield point are profoundly influenced by variation in conditions, e.g., pH. Solutions of the type of gelatin in water and rubber in suitable organic solvents, when not too concentrated, show a quite sharp gelation temperature, below which they will set to a gel but above which they do not. Such solutions in general show no yield point at temperatures above their gel point, but at these temperatures their viscosities can be profoundly influenced by addition agents and, at these temperatures if their viscosity-temperature curve be extrapolated downward, it approaches an infinite value of the viscosity asymptotically at the gel point, or, what is equivalent to the same thing, the fluidity becomes zero at that temperature. In other words, the temperature of gelation can be predicted in some cases remarkably closely from viscosity behavior at higher temperatures. The changes in properties in the immediate neighborhood of the gel temperature are extraordinarily rapid. Thus, Figure 9 shows the r.p.m.-torque curve of a gelatin solution at 30° C., and the corresponding values for the same solution agitated for different lengths of time before testing at 27° C. The gel point of this solution was 28° C. The transformation in the properties of the liquid in this narrow temperature range was extraordinary.

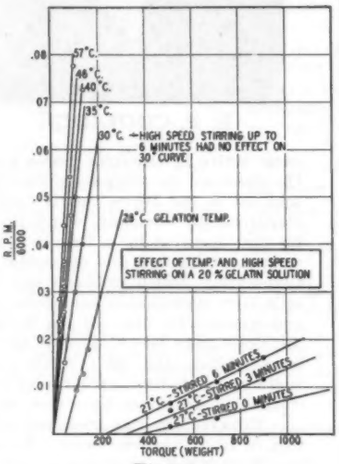

Figure 9

These outstanding differences are apparently due to the fact that, whereas the combination of solvent with the surface of the clay particles is slight, the corresponding solvation of such amorphous colloids as gelatin and rubber is enormous. The particles of the latter combine with the solvent and swell in extraordinary degree, thereby developing high viscosity at very low concentration. Furthermore, the extent of this solvation is profoundly influenced by the temperature, increasing as temperature falls. If the solution be sufficiently concentrated, a temperature is finally reached at which the solute has combined with practically all the solvent. The particles themselves now fill the whole volume of the liquid and consequently tend to set to a structure, i.e., to gelatinize. In the case of amphoteric materials such as gelatin, the degree of solvation and hence the viscosity of the solution is profoundly influenced by the pH. In any case, the addition of nonsolvent miscible with the solvent desolvates the particles, breaks the viscosity and will ultimately precipitate the colloid. None of these phenomena are encountered in the case of clay suspensions. In other words, the behavior of clay suspensions must never be confused with that of solutions of amorphous colloidal materials of high molecular weight, which solvate to high degree in solution.

Conclusion

In conclusion, it is hoped that this discussion has made it clear that extremely simple assumptions, themselves plausible in the light of all our knowledge of the structure of the clays, are adequate to serve as a thread through the complicated maze of the behavior of clay suspensions. These underlying assumptions are that the ultimate particles of the clays are extremely small, flat plates, the exterior surfaces of which consist predominantly of hydroxyl groups, chemically combined with the surface atoms of the particle structure. As is to be anticipated from the chemical characteristics of the alumina and silica of which the particles are built up, these surface hydroxyl groups are amphoteric but predominantly acidic, the acid character being extremely weak. In consequence, the highly polar hydroxyl groups exert strong fields of attractive force in the immediate neighborhood of the particle surface. Hence, when adjacent surfaces come face to face they are firmly held together and are thus able to build up large, stable, essentially linear aggregates. This results in strong tendency to gelation. The acidic clay surface is profoundly influenced by the pH of the suspending medium. The hydrogens of the hydroxyl groups can be replaced by metals and these in turn are capable of complicated interchange. The monovalent metal salts of the clay acids are evidently highly "dissociated," thereby greatly decreasing the intensity of the surface attractions. Increasing valence of the combined metal ions progressively decreases this effect. It is possible to separate the surfaces and reduce their mutual attractions by the absorption of various materials, but these effects appear to be chemical in character rather than the simple adsorption of protective colloids of the ordinary type. The solvation of clay particles is evidently a matter of secondary importance, order of magnitude less than that of the lyophilic colloids of the type of gelatin, rubber and the like. While our knowledge of the clays is seriously limited, the data indicate that a study of their behavior from the points of view here developed offers justifiable promise of a better understanding of their characteristics and a more satisfactory classification of their properties.

Gulf Coast Wildcats

(Continued from Page 149)

Texas Co.'s No. 7 Houston Oil Field Assn., 247.5 ft. S and 441.9 ft. W of NE cor. of Lot 8.
Drlg. shale and lime 3,540 ft.

Texas Co.'s No. 1-A Massey, 330 ft. out of NW cor. of 33-ac. tract in H. Stevens Sur.
Drlg. sandy shale and lime 7,671 ft.

PLEDGER—BRAZORIA COUNTY

Danciger O. & R. Co.'s No. 4-A Hurt, 200 ft. SW of No. 3-A, W. C. Carson Sur.
T.D. 6,820 ft.; trying to complete.

Humble O. & R. Co.'s No. 1 Bob McFarland, 525 ft. S, 1,900 ft. W of SE cor. W. C. Carson Sur.
Drlg. sand 6,687 ft.

STRATTON RIDGE—BRAZORIA COUNTY

Amerada Pet. Corp.'s No. 1 Bowers, 2,400 ft. N line and 1,550 ft. from E line of Jared Groce Sur.
Drlg. 2,420 ft.

BARBERS HILL—CHAMBERS COUNTY

McAlbert Oil Co.'s No. 7 J. F. Wilburn, 150 ft. W of No. 6 and C of H. Griffin Sur.
Salt 2,869 ft.

Mills Bennett Prod. Co.'s No. 2 Fisher, 150 ft. N of No. 1, Wm. Bloodgood Sur.
Sandy shale 5,418 ft.

Mills Bennett Prod. Co.'s No. 10 Wilburn, 150 ft. S N line, 150 ft. W of No. 9, Henry Griffith league.
Green shale 4,820 ft.

Humble O. & R. Co.'s No. 6-B Kirby, 593 ft. N of S line, 388 ft. E of W line of lease or 125 ft. N and 288 ft. W of No.5
Comp.; T.D. 5,246 ft.; I.P. 40 bbls. per hr.; ⅝-in. choke.
Humble O. & R. Co.'s No. 7-B Kirby, 200 ft. W of No. 6 in Henry Griffith league.
Rig up.
Sun Oil Co.'s No. 6 Higgins, 302 ft. W of E line and 432 ft. N of S line of lease.
Drlg. shale 3,308 ft.
Sun Oil Co.'s No. 10 Chambers, 50 ft. from N and W lines of lease.
Drlg. hard shale and lime 3,257 ft.
Sun Oil Co.'s No. 17 Wilburn fee, 188 ft. E of W line and 40 ft. S of N line and 134 ft. W of No. 16.
Derrick.
Sun Oil Co.'s No. 22 J. Wilburn, midway between wells No. 17 and 21, or 150 ft. from each well.
Drlg. shale and lime 3,218 ft.
Texas Gulf Prod. Co.'s No. 4-B E. W. Barber, 75 ft. S of Moody Corp.'s No. 6-A Barber and 75 ft. from SW line of 38-ac. lease, H. Griffith Sur.
Drlg. salt 1,738 ft.
Texas Gulf Prod. Co.'s No. 5 J. F. Wilburn, 110 ft. W of No. 3 and 50 ft. N of S line of lease, Wm. Hodge Sur.
Drlg. shale and lime 3,374 ft.
Texas Gulf Prod. Co.'s No. 3 O. W. Winfree, 595 ft. S of N line and 50 ft. W of E line of lease.
Drlg. cmt. 4,244 ft.
Yount Lee Oil Co.'s No. 25 Chambers County, 75 ft. S, 50 ft. W of NE cor. of lease
Sidetracking; T.D. 3,845 ft.
Yount Lee Oil Co.'s No. 27 Chambers Co., 400 ft. W of No. 24 and in line with Nos 24 and 21.
Derrick.
Yount Lee Oil Co.'s No. 28 Chambers County, 50 ft. N S line, direct offset to Sun's No. 10 Chambers County, Wm. Bloodgood Sur.
Derrick.
Yount Lee Oil Co.'s No. 9 Phillips, 100 ft W of No. 8.
Reaming to bottom, 3,234 ft.

BIG CREEK—FORT BEND

Edwards Drlg. Co.'s No. 2 Hausler, 500 ft. SW from No. 1 and 100 ft. from SE line of 103.5-acre tract, Barnabas Wickson Sur.
Digging cellar.

SALT RIDGE—FORT BEND COUNTY

Mills Bennett Prod. Co.'s No. 2 Luscher, 1,950 ft. S and 750 ft. E of westerly NW cor. 500-ac. tract, Thos. Hebermaches Sur
Cmtd. to sidetrack at 5,040 ft.; T.D. 5,189 ft.

BOLING—FORT BEND COUNTY

Allied Minerals, Inc.'s No. 1 J. H. Blackwell, 1,400 ft. from E line, 100 ft. from S line of 50-ac. of J. H. Blackwell 100 ac., John Huff Sur.
Location.
Allied Minerals, Inc.'s No. 1 E. C. Farmer, James Scott League, 750 ft. SE of NW line and 150 ft. SW of NE line of Gulf Prod. Co.'s E. C. Farmer 50-ac. tract.
Rig up.
Irwin Larsen et al's No. 1 J. R. Farmer, 100 ft. NW and 100 ft. SW from E cor. of 125-acre lease, James Scott Sur.
Location.

THOMPSON—FORT BEND COUNTY

Gulf Prod. Co.'s No. 6 Hammerstram, 330 ft. from S line, 330 ft. from N line of lease, Kennedy Sur.
Drlg. shale 5,214 ft.

ORCHARD—FORT BEND COUNTY

Gulf Prod. Co.'s No. 41 Moore, 3,372 ft. S along W line from NW cor. of James Frazier Sur., and 2,154 ft. at R/A.
Drlg. shale 3,612 ft.

HIGH ISLAND—GALVESTON COUNTY

Yount Lee Oil Co.'s No. 42 Cade, N. Fitzsimmons Sur., half way between Nos. 38 and 28 and 150 ft. E at right angles.
Rig up.
Yount Lee Oil Co.'s No. 22 Smith.
Drlg. shale 4,884 ft.
Yount Lee Oil Co.'s No. 1 Maco Stewart Martin Dunman Sur.
Drlg. shale and lime 3,707 ft.

BATSON—HARDIN COUNTY

John A. Deering et al's No. 1 Hooks, Willis Donoho Sur., S extension test.
Trying to get to bottom of hole; gas blew out at 4,895 ft.

ARRIOLA—HARDIN COUNTY

Houston Oil Co.'s No. 4-X Arriola fee, 400 ft. E of No. 3-X.
Drlg. 2,500 ft.
Republic-Houston Oil Co.'s No. 8 fee
P.B. to 3,052 ft.; trying to complete as gas well.

SARATOGA—HARDIN COUNTY

Hines Bros.' No. 1 Coswell.
Swabbing; T.D. 2,323 ft.

SOUR LAKE—HARDIN COUNTY

Alpha Pet. Co.'s No. 2 Weiss, E flank of dome.
T.D. 5,665 ft.; P.B. to 5,100 ft. to sidetrack.
Sun Oil Co.'s No. 2 Bernard Corp., 150 ft. from N and W lines of Lot 11, E.T.&B. Sur., Sec. 69.
Drlg. shale 6,080 ft.
Texas Co.'s No. 313 fee, 150 ft. S and 250 ft. E of No. 308 fee.
Rig up.
Texas Co.'s No. 312 T. T. Co. fee, 200 ft. N and 200 ft. E of No. 302.
7-in. csg. 1,775 ft.; T.D. 1,808 ft.; I.P. 90 bbls. per day; ¼-in. choke; comp.

GOOSE CREEK—HARRIS COUNTY

Kerring's No. 1 Williams, 150 ft. from SE cor. and 55 ft. NE of Hybush's No. 3, in W. Scott upper league.
Cellar.
Humble O. & R. Co.'s No. 80 Simms-Smith Scott Lower League, 1,000 ft. E of the most westerly W line, and 300 ft. N of the most northerly S line.
Drlg. shale 6,438 ft.

PIERCE JUNCTION—HARRIS COUNTY

A. & P. Prod. Co.'s No. 8 Whitehead, 150 ft. S of No. 5; 50 ft. from E line of lease, J. Hamilton Sur.
Drlg. 2,960 ft.
Benedum & Trees' No. 1 W. J. Settegast, 5,639 ft. from S line of Sur., and 100 ft. from E line of tract in the J. Kopman Sur.
S.D. 6,701 ft.
Gulf Prod. Co.'s No. 10 H. C. Cain, 399 ft. S and 290 ft. E of NW cor. of lease and 217 ft. N of No. 9, J. Hamilton Sur No. 879 (workover).
Drlg. sand 6,077 ft.
Rio Bravo Oil Corp.'s No. 9-A Settegast, 1,575 ft. N line, 350 ft. E line NE cor "A" lease, J. A. Kopman Sur.
T.D. 4,510 ft.; standing.

MYKAWA—HARRIS COUNTY

Danciger Oil & Ref. Co.'s No. 2 Minnetex, 150 ft. of N line and 85.9 ft. of E line of lease, Lot 253, Wm. Lovett Sur.
No report.
West Prod. Co.'s No. 1 Erin, C of Lot 17, Erin Gardens Subd., F. J. Rothaas Sur.
Coring sand and shale 5,658 ft.

TOMBALL—HARRIS COUNTY

Amerada Pet. Corp.'s No. 2 Metzler, 466 ft. out of NW cor., Joseph House Sur.
Rigging up.
Amerada Pet. Corp.'s No. 3 Fitz-Rudel, 466 ft. from E line, 500 ft. from S line of 80-ac. lease, Joseph House Sur.
Bldg. derrick.
Humble Oil & Ref. Co.'s No. 5-B Hope, 1,900 ft. from S line and 466 ft. from W line of "B" lease, A. Senchall Sur., Abst. 722.
Location.
Humble Oil & Ref. Co.'s No. 1 J. Wright, 318 ft. from SE line, 318 ft. from SW line of lease, J. House Sur.
T.D. 5,596 ft.; I.P. 2,000,000 ft. of gas; comp.
Humble Oil & Ref. Co.'s No. 2 J. Holdereith, 466 ft. S of most S line of cemetery and 572 ft. from E line of tract, C. N. Pillot Sur.
Drlg. sand 5,566 ft.
Humble O. & R. Co.'s No. 2 Kohs, 1,061 ft. S from N line, 623 ft. E of W line of 195-ac. tract, J. M. Hooper Sur.
Drlg. sand 927 ft.

KITTRELL-HOUSTON AND WALKER COUNTIES

Ben G. Barnett's No. 1 W. A. Reynolds, 330 ft. out of NW cor. of the NW 20 acres of the S 93 acres of Denton & Marshall lease, L. R. Clapp Sur.
Tested 30 fourbles of fresh wtr. from 1,990-2,010 ft.; reaming; T.D. 2,010 ft.
Boone Bros.' No. 1-A Texas Ling Leaf Co., 330 ft. from N and W lines of Texas Long Leaf Lbr. Co.'s 379-acre tract, Geo. Kellman Sur.
Drlg. water well.
Crown Central Pet. Corp.'s No. 1 Texas Long Leaf Lbr. Co. and Thompson Bros., 150 ft. from W line, 150 ft. from N line of 40-ac. tract in J. S. Estheridge Sur., Abst. 399.
Location.
Dick Hooper's No. 1 Mangum, Charles McEllis Sur. No. A-382, due S of discovery well.
Abd. 2,127 ft.
Humble O. & R. Co.'s No. 2 Shaw, 330 ft. from SE line of lease and 660 ft. SW of No. 1 Charles McEllis Sur.
Drlg. shale 1,210 ft.
Humble O. & R. Co.'s No. 1 Texas Long Leaf Lbr. Co., 330 ft. from SW line and 330 ft. from SE line of Texas Long Leaf Lbr. Co., 696-ac. tract, C. C. McEllis Sur.
T.D. 2,939 ft.; P.B. to 1,176 ft.; drlg. shale 1,880 ft.
Humble O. & R. Co.'s No. 2 Texas Long Leaf Lbr. Co., 330 ft. SW of NE line, 660 ft. SE of No. 3, Chas. McEllis Sur., Abst. 382.
Location.
Humble O. & R. Co.'s No. 3 Texas Long Leaf Lbr. Co., 130 ft. SE of NW line, 320 ft. SW of NE line, and 660 ft. NW of No. 2, Chas. McEllis Sur.
Location.
Lion Oil & Ref. Co.'s No. 1 Stokes Heirs, 330 ft. SW of NE line and 330 ft. NW of SE line of the N 58 acres of 275-acre tract, J. Callahan Sur.
Tested fresh wtr. 2,051-71 ft.; abd. 2,168 ft.
Lacy & Miller's No. 1 J. A. Hanner, 330 ft from E line of lease, Wm. Dillard Sur.
S.D. 1,852 ft.
Trinity Dev. Co.'s No. 1 G. A. Knox, 1,000 ft. from SE line and 500 ft. from SW line of Wm. Prissick Sur.
Rig up.

VANDERBILT—JACKSON COUNTY

Imperator Oil Co.'s No. 1 Dutton, S C of Lot No. 11, Blk. 25, 450 ft. S of R.R. and 1,350 ft. W line of townsite, Ray Musquiz Sur.
Rigged up and S.D.
Turman Oil Co.'s No. 1 T. H. Miller, 150 ft each way out of E 50-ac. of Miller 100 ac. tract in Ray Musquiz Sur.
Rig up.

BIG HILL—JEFFERSON COUNTY

Yount Lee Oil Co.'s No. 1-A Pipkin, 2,640 ft. S and 2,050 ft. W of NE cor. of survey
Rig up.

PANNETT—JEFFERSON COUNTY

Gulf Prod. Co.'s No. 15 Thomas, 200 ft W of Gulf's No. 7 Burrell
Drlg. cap rock 2,015 ft.

CLEVELAND—LIBERTY COUNTY

Gulf Prod. Co.'s No. 6-C Kirby, 2,796 ft along N line of John Pleasants Sur. from NE cor. James Eldridge Sur. and 217 ft. E at right angles.
Drlg. sand 5,847 ft.

ESPERSON—LIBERTY COUNTY

General Crude Oil Co.'s No. 14 Moores Bluff 1,675 ft. S, 10 deg. E min. E of No. 10.
T.D. 3,830 ft.; set 13⅜-in. csg. at 1,346 ft.
General Crude Oil Co.'s No. 9 Davis, 1,320 ft. each way from S and E lines of lease in D. Kokernut Sur.
Drlg. hard shale 5,094 ft.
General Crude Oil Co.'s No. 1 W. D. Kay, Malcom Duncan Sur., 1,537 ft. along N line from NE cor., 560 ft. S at R/A.
Location.

HANKAMER—LIBERTY COUNTY

George Devore et al's No. 1 S. E. Exell, 174 ft. S of Gulf's No. 1 and 165 ft. from E line of 175-ac. lease in Levi Barrow Sur
T.D. 2,617 ft.; testing through ⅝-in. choke.

HULL—LIBERTY COUNTY

G. R. Brown and S. F. Bashara's No. 1 David Hannah, Jesse Devore league, 100 ft. S line, 150 ft. E line, 42-ac. Gulf tract
Derrick.

BUCKEYE—MATAGORDA COUNTY

United North & South Dev. Co.'s No. 1 Unit 4, Buckeye farm, J. C. Keller league 214 ft. N line and 202 ft. E line of lease
Swbd. S.W. and oil 7,881 ft.
United North & South Dev. Co.'s No. 1 Pletner, 1,210 ft. SE No. 1 Stoddard and 130 ft. W of right of way S.T.L.&B.M.Ry. Sur
T.D. 7,910 ft.; swbng.; P.B. to 7,900 ft. after testing S.W.
United North & South Dev. Co.'s No. 1 Unit No. 58, 250 ft. N and 200 ft. W of SE cor of Unit No. 58.
P.B. to 7,900 ft. after testing salt water.

MARKHAM—MATAGORDA COUNTY

Hawkins Oil Co.'s No. 1 Hawks fee, 1,350 ft from N line and 1,650 ft. from E line of 20-ac. lease.
T.D. 600 ft.; derrick down.
Powers Prod. Co.'s No. 4 Myers, in line with wells Nos. 1 and 2, being 250 ft. E of No. 2.
Derrick down.

CONROE—MONTGOMERY COUNTY

Humble O. & R. Co.'s No. 1 Dodson, 250 ft from W line, 765 ft. N of No. 1, W.C.R.R Sur.
Comp.; no gauge; T.D. 5,157 ft.
George W. Strake's No. 2 Schaffe, 300 ft. from E line, 467 ft. from S line, C. B. Stewart Sur.
Cmtd. surface csg.

ORANGE—ORANGE COUNTY

Trio Oil Co.'s No. 1 D. S. Comier, 60 ft. W of E line and 30 ft. S of N line of 6.83-ac tract in W. M. Dyson Sur.
Prepare to spud.

PORT NECHES—ORANGE COUNTY

Texas Co.'s No. 6 Kuhn, 150 ft. E, 150 ft N of SE cor. of Mary Hall Sur.
Rig up.
Texas Co.'s No. 8 Kuhn, 1,320 ft. N and 250 ft. E of SE cor. of Mary E. Hall Sur No. 2 in T. J. Notgrass Sur.
Drlg. shale 6,109 ft.
Texas Co.'s No. 9 Kuhn, 990 ft. N and W of SE cor. of Mary E. Hall Sur. No. 3
Drlg. shale and lime 5,372 ft.

LIVINGSTON—POLK COUNTY

T. D. Humphries' No. 1 J. C. Whitforth Block H.
Derrick.
Sun Oil Co.'s No. 1 Pratt, A. Viesca Sur., 330 ft. N line and 330 ft. E line of lease.
S.D. 4,343 ft.

GRETA—REFUGIO COUNTY

Atlantic and Stanolind's No. 7-G O'Brien.
Derrick.
Hewitt & Daugherty's No. 13 Lambert.
No report.
Humble Oil & Ref. Co.'s No. 9 Fannie Heard 933 ft. E of No. 7, 1,150 ft. S of No. 8.
Drlg. sand 4,389 ft.
Humble O. & R. Co.'s No. 13 J. F. B. Heard, 933 ft. S of No. 11, 933 ft. E of No. 6.
T.D. 4,380 ft.; I.P. 787 bbls. per day; ⅝-in. choke.
Stanolind O. & G. Co.'s No. 3 J. M. O'Brien Peoples Sur.
No report.
United Prod. Co.'s No. 14 Fox (D.D.), 466 ft. from N line of 848-ac. tract and 1,060 ft. W of No. 11, Wm. Hews and L. Brown Sur.
T.D. 3,500 ft.; comp.; no gauge; 1,500 lbs. csg. pressure; 1,200 lbs. tubing pressure; ¼-in. choke; drlg. gas well; comp.

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Stanolind O. & G. Co.'s No. 4-A O'Brien, 1,000 ft. from N line, 800 ft. from S line of 79.8-ac. lease, Peeples Sur.
Drlg. 1,360 ft.

United Prod. Co.'s No. 10 M. F. Lambert, Charles Hardwick Sur., 466 ft. from S line, 506 ft. from E or W line of Blk. 17. T.D. 3,502 ft.; putting on gas lift.

United Prod. Co.'s No. 11 M. F. Lambert, E. W. Hardwick Sur., 434 ft. from S line, 506 ft. from E line of Blk. 3. T.D. 4,390 ft.; cmtd. 9⅝-in. csg. at 3,476 ft.

United Prod. Co.'s No. 13 M. F. Lambert, Hardwick Sur., 469 ft. from S line, 506 ft. from W line of Blk. 4. T.D. 3,490 ft.; drilled plugs.

REFUGIO—REFUGIO COUNTY

Houston Oil Co.'s No. 1 Johnson, center of Blk. 63; (workover). Perforated csg. 5,160-75 ft.; set screen; T.D. 5,190 ft.; putting on gas lift.

Houston Oil Co.'s No. 17 W. J. J. Heard, 660 ft. SE of No. 16 W. J. J. Heard. Building derrick.

Houston Oil Co.'s No. 16 W. J. J. Heard, 660 ft. SE of No. 15. T.D. 4,938 ft.; W.O.C.

Houston Oil Co.'s No. 16 F. B. Rooke, 640 ft. W of No. 15. T.D. 4,915 ft.; coreć sand 4,912-15 ft.; trying to make D.S. test.

Houston Oil Co.'s No. 17 Rooke, 600 ft. SW of No. 16 Rooke. Derrick.

United Prod. Corp.'s No. 6 Power, center of Blk. 83, townsite. W.O.; old T.D. 5,458 ft.; P.B. to 5,137 ft.; perforated csg. 5,172-78 ft.; cmtd. csg.

United Prod. Co.'s No. 8 J. A. Lambert, 858 ft. N of NW cor. of W. Heard tract and 150 ft. W of tract line, L. M. Rogers Sur. T.D. 6,161 ft.; light spray of oil; 100 lbs. csg. pressure.

COLETO CREEK—VICTORIA COUNTY

Rupert Cox's No. 1 Antone Trybil, R. Manchola Sur. Derrick.

Albert Plummer's No. 2 Terrell, 695 ft. from NW line, 330 ft. NE line of 57-ac. tract, Manchola Sur. Drlg. sandy shale 3,546 ft.

Albert Plummer's No. 1 Zimmer, 330 ft. NE and SE lines of lease in Manchola Sur. Sand 4,510 ft.; testing.

KEERAN—VICTORIA COUNTY

Gulf Prod. Co.'s No. 6 Keeran, begin at intersection of R.R. and SW line of survey, thence NE along R.R. 6,257 ft., thence NW at R/A 2,539 ft. in M. DeLeon Sur. Comp. as gas well; T.D. 5,608 ft.

McFADDIN-O'CONNOR DISTRICTS—VICTORIA AND REFUGIO COUNTIES

Humble Oil & Ref. Co.'s No. 2 McFaddin, C. O. Edwards Sur. Drlg. sand 4,535 ft.

Humble Oil & Ref. Co.'s No. 16 O'Connor, 933 ft. N by 45 deg. E of well No. 15, F. Rois Sur. Drlg. sand 3,040 ft.

Texas Co.'s No. 2 McFaddin, 9,150 ft. S and 200 ft. at R/A out of NW cor. of C. M. B. Hoyt Sur. Drlg. hard lime 6,129 ft.

CLAY CREEK—WASHINGTON COUNTY

Sun Oil Co.'s No. 2 Kubel. Abd. 2,794 ft.

LOUISE—WHARTON COUNTY

Pure Oil Co.'s No. 3 Garrett, 990 ft. from NW and 330 ft. from NE of S cor. Sec. 28, T. W. Heard Sur. Set 10¾-in. csg. at 1,173 ft.

Pure Oil Co.'s No. 2 Stewart, Morris & Cummings Sur., Sec. 25, 990 ft. out of SW cor. of 160 acres. Sidetracking 7,696 ft.

SOUTH LOUISIANA FIELDS

BLACK BAYOU—CAMERON PARISH

Brownie Babbette Oil Co.'s No. 1 R. A. Moore, 562 ft. W, 50 ft. S of NE cor. of E½ of SE Sec. 18-12s-12w. Swabbed S.W. and S.D.; T.D. 6,298 ft.

Shell Pet. Corp.'s No. 3 State. Prepare to make D.S. test; T.D. 6,305 ft.

Shell Pet. Corp.'s No. 20 Watkins, 1,611 ft. S and 216 ft. W of NE cor. Sec. 18-2s-12w. Running csg.; T.D. 1,270 ft.

BOSCO—ACADIA AND ST. LANDRY PARISHES

Superior Oil Co.'s No. 2 Arceneaux, 1,968 ft. S and 1,708 ft. W of NE cor. of Sec. 35-8s-3e. Derrick.

Superior Oil Co.'s No. 2 Comeaux, 1,876 ft. S and 467 ft. W of NE cor. Sec. 34-8s-3e. Drlg. sand and shale 5,430 ft.

Superior Oil Co.'s No. 2 Hermances, 1,175 ft. S, 527 ft. E of NW cor. Sec. 34-8s-3e. Set 9⅝-in. csg. 7,825 ft.; comp.; I.P. 410 bbls. in 24 hrs.; tubing pressure 1,950 lbs.; csg. pressure 2,500 lbs.; T.D. 7,847 ft.

Superior Oil Co.'s No. 3 Iseringhauser, 1,517 ft. E, 330 ft. N of SW cor. Sec. 27. Derrick.

Superior Oil Co.'s No. 1 Malancon, 375 ft. S and 43 ft. E of NW cor. SW Sec. 34-8s-3e. Drlg. sand and shale 7,308 ft.

Superior Oil Co.'s No. 2 Larcade, 503 ft. N and 1,197 ft. E, SW cor. Sec. 26-8s-3e. Drlg. sand and lime 7,641 ft.

Superior Oil Co.'s No. 4 Larcade, 653 ft. S and 2,292 ft. E from NW cor. of Sec. 35-8s-3e. Derrick.

Superior Oil Prod. Co.'s No. 1 Euclide LeBlanc, 1,873 ft. S and 673.2 ft. W of NE cor of Sec. 33-8s-3e. Comp.; no gauge; T.D. 8,035 ft.

Superior Oil Prod. Cor.'s No. 1 Lucien Lavergne, 596 ft. E and 330 ft. N of SW cor. of Sec. 27-8s-3e. Milling on bit.

Superior Oil Prod. Co.'s No. 1 Moise Lavergne, 369.7 ft. W and 98 ft. N of SE cor. of Sec. 28-8s-3e. Derrick.

Superior Oil Prod. Co.'s No. 1 Auguste Martinez, 2,510.6 ft. S and 1,067.2 ft. W of NE cor. of Sec. 35-8s-3e. P.B. to 9,103 ft.; T.A.; T.D. 9,325 ft.

Superior Oil Co.'s No. 1 Trahan, 1,392 ft. N, 543 ft. W of SE cor. Sec. 27. Drlg. sandy shale 3,048 ft.

Superior Oil Co.'s No. 3 Hermandes, 329 ft. from S line, 669 ft. W of NE cor. of NW of Sec. 34-8s-3e. Rig up.

Superior Oil Co.'s No. 2 Iseringhauser, 659 ft. from W line, 330 ft. from N line of 21.86-acre tract, Sec. 35-8s-3e. Drlg. shale 7,828 ft.

Superior Oil Co.'s No. 1 L. Johnson, 1,623 ft. N and 762 ft. E of SW cor. of NE of Sec. 34-8s-3e. Drlg. sand and shale 8,638 ft.

Superior Oil Co.'s No. 3 Larcade, 542 ft. E and 500 ft. N of SW cor. of Sec. 26-8s-3e. Drlg. sand 5,840 ft.

BAY JUNOP—TERREBONNE PARISH

Texas Co.'s No. 5-B State, 2,202 ft. N and 944 ft. E of SW cor. of Sec. 23-21s-14e. Drlg. anhyćrite 4,247 ft.

CAILLOU ISLAND—TERREBONNE PAR.

Texas Co.'s No. 14 State-Caillou Island, 1,514 ft. E and 2,628 ft. S, NW cor. Sec. 20-22s-20e. T.D. 3,985 ft.; I.P. 1,900 bbls. per day; ½-in. choke; comp.

CAMERON MEADOWS—CAMERON PAR.

Burton-Sutton's No. 1 School Land. Drlg. sand 4,531 ft.

Burton-Sutton Oil Co.'s No. 4 School Land, 2,891 ft. W and 150 N of SE cor. of Sec. 16-4s-13w. Derrick.

Texas Co.'s No. 1 Miami Corp. Washing to bottom 7,175 ft.

EDGERLY—CALCASIEU PARISH

Edgerly Oil Co.'s No. 2 Bright-Penn, 300 ft. S and 150 ft. W of NE cor. Sec. 28-9s-11w. Location.

Emerson Oil Co.'s No. 1 Bright-Penn. Drlg. 3,765 ft.

Emerson Oil Co.'s No. 2 Yount Lee, 300 ft. S, 150 ft. W of NW cor. NE cor. SW Sec. 28-9s-8w. Location.

Union Sulphur Co.'s No. 2 Hunter, 1,366 ft. N 425 ft. W of SE cor. SW Sec. 21-9s-11w. Prepare to sidetrack; T.D. 5,364 ft.

DOG LAKE—TERREBONNE PARISH

Texas Co.'s No. 11 State, 150 ft. N and 2,474 ft. W, SE cor. Sec. 31-21s-16e. Building derrick.

Texas Co.'s No. 15 State, 2,602 ft. N and 1,368 ft. W, SE cor. Sec. 31-21s-16e. Drlg. sand 1,035 ft.

GUEYDAN—VERMILLION PARISH

Pure Oil Co.'s No. 6, Alliance Trust, 667 ft. E, 1,787 ft. S line of lease, Sec. 34-11s-1w. Drlg. shale 9,268 ft.

HACKBERRY—CAMERON PARISH

Gulf Ref. Co.'s No. 15-A M. P. Irwin, 368 ft. N and 341 ft. W of the SE cor. of Sec. 12-12-10. Drlg. sand and shale 6,217 ft.

Texas Co.'s No. 13-B State, 400 ft. N of NE cor. of lease, Sec. 13-12s-10w. Set 20-in. csg. at 64 ft.

Texas Co.'s No. 14 State, 500 ft. SE of No. 13, Sec. 13-12s-10w. Location.

Union Sulphur Co.'s No. 1 Barbee est., 1,730 ft. N line, 330 ft. E of SW cor. Sec. 12-12s-10w. Drlg. shale 4,647 ft.

Union Sulphur Co.'s No. 9 Humble, 300 ft. E and slightly N of No. 1 well, or 730 ft. N and 370 ft. E of the SW cor. of Sec. 12-12s-10w. Coring shale and lime 5,396 ft.

Yount Yee Oil Co.'s No. 1-A Gulf Land, 2,000 ft. S and 50 ft. E of the NW cor. of Sec. 22-12-10. Rig up.

Yount Lee Oil Co.'s No. 4 Carter, 160 ft. S, 305 ft. W of NE cor. of 30-ac. lease, Sec. 22-12s-10½w. Location.

Yount Lee Oil Co.'s No. 2-A Gulf Land, 1,100 ft. S and 50 ft. E of the NW cor. of Sec. 21-12-10. Rig up.

Yount Lee Oil Co.'s No. 15-A Gulf Land, 1,160 ft. S and 715 ft. W of the NE cor. of the SW of Section 16-12-10. Drlg. shale 3,354 ft.

NEW IBERIA—IBERIA PARISH

I. Delcambre's No. 1 Viatar, 150 ft. E, 150 ft. S and 150 ft. W of SE cor. of tract, Sec. 41-12s-5e. Fishing 245 ft.

Harrison & Abercrombie's No. 1 J. E. Schuring, 3,480 ft. S 75 deg. 35 min. west along section line from E cor. of fractional Sec. 44-12s-8e, and thence 1,131 ft. N 11 deg. 35 min. W, or at R/A to said line in Sec. 56-12s-7e. Drlg. shale 3,225 ft.

Y. D. Spell's No. 2 Sabiater, 1,200 ft. N and 28 ft. W of E line, Sec. 54-12s-7e, 150 ft. N of discovery well. Drlg. shale 3,110 ft.

IOWA—CALCASIEU AND JEFF DAVIS PARISHES

Magnolia Pet. Co.'s No. 10 Wait, 330 ft. N and E of SW cor. of lease. Cmtd. 13⅜-in. csg.; T.D. 1,438 ft.

Magnolia Pet. Co.'s No. 3 Willett, 335 ft. from S line, 990 ft. from W line of NW Sec. 7-9s-6w. Running 7-in. csg.; T.D. 6,970 ft.

Shell Pet. Corp.'s No. 1 Scott, 330 ft. out of NW cor. of lease. Redrig. in sidetracked hole.

Shell Pet. Corp.'s No. 5 Stratford, 1,094 ft. S, 330 ft. E of NW cor. of Sec. 18. Fishing 6,909 ft.

Shell Pet. Corp.'s No. 3 Ardoin, 990 ft. S and 300 ft. E of NW cor. S½ NW Sec. 18-10s-6e. Trying to mud off gas; T.D. 6,670 ft.

Shell Pet. Corp.'s No. 3 Tuten, 1,159 ft. W and 330 ft. from S of NE cor. SE Sec. 13-9s-6w. Drlg. shale and lime 4,028 ft.

JENNINGS—ACADIA PARISH

Port City Oil Co.'s No. 14 Jennings Haywood, 150 ft. N and 25 ft. W of No. 13. T.D. 1,620 ft.; prepare to deepen.

Yount Lee Oil Co.'s No. 14 Houssiere-Latrielle, 260 ft. N of No. 13, Sec. 47-9s-2w. Drlg. shale 5,718 ft.

LAKE BARRE—TERREBONNE PARISH

Texas Co.'s No. 11 L.L.&E., Sec. 36-21s-20e. T.D. 2,693 ft.; sidetracked at 2,668 ft.; drlg. lime and anhydrite 2,753 ft.

Texas Co.'s No. 12 L.L.&E. Prepare to sidetrack; T.D. 2,675 ft.

LAKE HERMITAGE—PLAQUEMINES PARISH

Humble O. & R. Co.'s No. 2 LaFourche, Basin Levee Dist. Drlg. sand 4,820 ft.

LAKE PELTO—TERREBONNE PARISH

Whitstone O. & G. Co.'s No. 1 Buckley, 300 ft. S and E of NW cor. SW SW Sec. 35-19s-16e. S.D. 2,700 ft.

LAKE WASHINGTON—PLAQUEMINES PARISH

Humble O. & R. Co.'s No. 23 Cockrell-Moran, 650 ft. N and 21 deg. 30 min. E of No. 2 in Twp. 20s-26e. Drlg. shale 3,020 ft.

LEESVILLE—LAFOURCHE PARISH

Emerald Pet. Co.'s No. 7 State of Louisiana. Derrick.

Gulf Prod. Co.'s No. 10 Bernard, 1,833 ft. E, 958 ft. S of NW cor. Sec. 26-21s-22e. Location.

Gulf Prod. Co.'s No. 2 Community, 50 ft. W and 1,300 ft. E of NW cor. Sec. 26-21s-22e. Derrick.

Gulf Prod. Co.'s No. 9 Bernard, midway between Gulf's No. 3 and No. 7 on L. Bernard lease, 48 ft. from NS line of lease, Sec. 26-21s-22e. Comp.; I.P. 1,172 bbls. per day; ⅝-in. choke; T.D. 3,882 ft.

Gulf Prod. Co.'s No. 8 Bernard, 568 ft. E along S line of 5.08-ac. tract from SW cor. and 446 ft. N at right angles, Sec. 26-21s-22e. Drlg. sandy shale 4,562 ft.

Emerald Pet. Co.'s No. 8 State of La., 455 ft. N of No. 1. T.D. 4,041 ft.; P.B. to 3,585 ft.

Emerald Pet. Co.'s No. 10 State, west bank, 300 ft. S of well No. 1. Location.

Emerald Pet. Co.'s No. 11 State, east bank, 327 ft. N of well No. 1. Location.

Emerald Pet. Co.'s No. 12 State, east bank, 250 ft. S of well No. 1. Location.

Frank L. Hill's No. 1 Bernard, 1,423 ft. N and 808 ft. E of SW cor. Sec. 26-21s-22e. S.D. 3,670 ft.

Leesville Oil & Gas Co.'s No. 1 Southern Louisiana Canal Navigation Co., 35 ft. W of Bank of Bayou, 15 ft. N of S bank, Sec. 26-21s-22e. Drlg. shale 3,875 ft.

Texas Co.'s No. 20 L.L.&E., Sec. 27-21s-22e Drlg. sand 3,413 ft.

LOCKPORT—CALCASIEU PARISH

Magnolia Pet. Co.'s No. 12 Bordages, 966 ft. W and 93 ft. N of SE cor. N½ NE Sec. 3-10s-13w. No report.

Union Sulphur Co.'s No. 1 Moss (W.O.). P.B. and sidetracked from 3,231-78 ft.

Union Sulphur Co.'s No. 1 Farquaher, 200 ft. S and W lines, NE cor. SW SE Sec. 36-12s-10w, 2-ac. tract. T.D. 6,715 ft.; est. making 2,000,000 ft. of gas and 169 bbls. of oil.

PORT BARRE—ST. LANDRY PARISH

Gulf Prod. Co.'s No. 8 Wilson Cochran, 568 ft. E along S line of L. Bernard 5.08-acre tract from SW cor. of Sur., 446 ft. N at right angles to said line, being 400 ft. N of line drawn through No. 1 and No. 3, Sec. 26-22s-12e. Rig up.

Phillips Pet. Co.'s No. 1 Sibille, 3,063 ft. S from R.R. along W line of Sibille Co., Inc., 180-acre tract and 50 ft. E in Sec. 7-6s-6e. T.D. 4,435 ft.; abd.

ROANOKE—JEFFERSON DAVIS PARISH

Humble O. & R. Co.'s No. 3 Devilbiss, 1,399 ft. W, 466 ft. S of NE cor. Sec. 14-9s-4w. Reaming 8,746 ft.; shale.

Humble O. & R. Co.'s No. 1-B Devilbiss. Drlg. shale 7,918 ft.

Shell Pet. Corp.'s No. 1 Jarnigan, 330 ft. E, 660 ft. S, NW cor. Sec. 12-9s-4w. P.B. to 8,748 ft.; washed; well failed to flow; now S.D.

SORRENTO—ASCENSION PARISH

Union Sulphur Co.'s No. 26 United Land. Drlg. 4,914 ft.

SULPHUR—CALCASIEU PARISH

Union Sulphur Co.'s No. 795 fee. Drlg. hard sand and lime 6,561 ft.

Union Sulphur Co.'s No. 802 fee, 908 ft. N, 1,340 ft. E of C of Sec. 29-9s-10w. Testing; T.D. 4,700 ft.

Union Sulphur Co.'s No. 805 fee. T.D. 3,379 ft.; sand with S.O. at 3,371-79 ft.; comp.; no gauge.

Union Sulphur Co.'s No. 2 Kelly, 1,345 ft. S, 198 ft. W of the NE cor. of Sec. 30-9s-10w. Drlg. rock 5,361 ft.

SWEET LAKE—CAMERON PARISH

Pure Oil Co.'s No. 12 Yount Lee fee, 800 ft. S of No. 11, in line with Nos. 9 and 10, Sec. 12-12-3w. S.D. 7,439 ft.

VINTON—CALCASIEU PARISH

Marrs McLean's No. 15 F. H. Gray, 342 ft. N and 338 ft. E of SW cor. Sec. 32-10s-12w. Old T.D. 2,716 ft.; prepare to W.O.; to sidetrack at 1,495 ft.

Vinton Oil Co.'s No. 1 J. G. Gray, 330 ft. from N line and 545 ft. from E line of SE NE Sec. 4-11s-12w. Drlg. sand and boulders 3,272 ft.

Wilson Broach's No. 7 Wilson (W.O.), Sec. 33-10s-12w. T.D. 3,432 ft.; P.B. to 2,938 ft.

WHITE CASTLE—IBERVILLE PARISH

Shell Pet. Corp.'s No. 9 Wilburn, 300 ft. E of No. 7. P.B. to 6,334 ft.

MISCELLANEOUS WILDCATS

TEXAS

ANGELINA COUNTY

Thayer et al's No. 1 Dearmond, J. T. Peavy Sur., 2½ miles SE of Zavalla. Hard lime 1,915 ft.; T.D.

BRAZORIA COUNTY

Amerada Pet. Corp.'s No. 1 Houston Farm Dev. Co., 1,414 ft. N, 316 ft. W of SE cor. of L. Bachelder Sur. Drlg. shale 7,077 ft.

Harrison & Abercrombie's No. 1 Bernard River Land, 1,000 ft. out of SE cor. of Lot 23. Drlg. shale 7,881 ft.

Gillock Pet. Co.'s No. 1 Frank Truksa, 300 ft. from S and 1,000 ft. from E lines of 75-ac. tract, Sec. 7, H.T.&B.R.R. Sur. Drlg. shale 7,236 ft.

Holt et al's No. 1 Griffith, J. B. Bailey Sur. T.D. 4,200 ft.; waiting orders.

Stanolind Oil & Gas Co.'s No. 1 J. W. Surface, 466 ft. N and 400 ft. W of most easterly SE cor. of 75.9-acre tract, A.C.H. &B. Sur., Abst. 462. Rig up.

BRAZOS COUNTY

Buck Wallace's No. 1 Broach, 1,000 ft. from S line, 400 ft. from W line of 251-ac. tract in G. W. Singleton Sur. T.D. 869 ft.; S.D.

CALHOUN COUNTY

Continental Oil Co.'s No. 1 American Nat. Realty Co., C of NE of Sec. 6, Blk. C. Rotating 7⅝-in. csg. at 6,700 ft.

Steen Drlg. Co.'s No. 1 Stansel, 500 ft. along N line from NW cor., thence 350 ft. at R/A of 371.2-ac. tract, A. E. Parsa Sur. Drlg. sand and shale 5,262 ft.

CHAMBERS COUNTY

Sun Oil Co.'s No. 1 Hamilton, 1,400 ft. from N line, 1,400 ft. from W line of survey, T.&N.O. Sur., Sec. 128. Rig up.

COLORADO COUNTY

Coyle-Concord Oil Co.'s No. 1 Nelson, 1,320 ft. SE of NW cor. of Sec., 2,200 ft. SW at right angles in L.&G.N. Sur. S.D. 6,194 ft.

FORT BEND COUNTY

W. A. Shafer et al's No. 1 V. B. Bortash, 693 ft. SW of NE line and 1,003 ft. NW of SE line of Sec. 52, H.&T.C. Sur. S.D. 2,150 ft.

Vico Oil Co.'s No. 1 H. R. Darst, 5,690 ft. N of S line and 635 ft. W of E line of E. Powell Sur. S.D. 1,670 ft.

Wilks et al's No. 1 Norris, 300 ft. W and 1,362 ft. S of N cor. of 525-ac. tract (5 miles S of Needville). Rigged up and S.D.

GALVESTON COUNTY

Gillock Pet. Co.'s No. 3 Mace Stewart, 990 ft. N and 150 ft. W of No. 1, Alex Farmer Sur. T.D. 1,500 ft.; waiting on surface pipe.

H. E. Sedberry, trustee's No. 1 Thomas Shaw (200 acres), 150 ft. NW line, 166 ft. NE line, Lot 66, Sec. 7, Hall & Jones Galveston Island. S.D. 53 ft.

Humble O. & R. Co.'s No. 1-B Stewart, 415 ft. S of Dickinson Bayou, 460 ft. E of N line of Blk. 16, Beatty Subd., John Sellers Sur. Drlg. shale 7,825 ft.

Pure Oil Co.'s No. 1 J. W. Sholar (281.1 acres), 2,750 ft. S of Dickinson-San Leon highway and midway E and W lines of lease, B.B.B.&C. Sur. Drlg. shale 7,729 ft.

GRIMES COUNTY

Hubert Holt et al's No. 1 Simon Fuqua, 1,200 ft. N of S line and 400 ft. W of E line of 177-ac. lease and survey, Moses Evans Sur. Drlg. gumbo 810 ft.

Dr. Marshall et al's No. 1-B Todd, 300 ft. from E line and 175 ft. from N line of 150-ac. tract in extreme NW cor. of county (35 ft. N of No. 1). Laying water line; T.D. 880 ft.

W. D. Roan et al's No. 1 D. C. Kelly, 1,833 ft. from N line and 168 ft. from E line of U. Sanders Sur., near Carlos. T.D. 2,360 ft.

J. H. Woodward et al's No. 1 O. A. Hamilton, center of Hamilton 95.5-ac. tract 8 of Richards in the O. Hill Sur. S.D. 3,290 ft.

HARDIN COUNTY

Kirby Pet. Co.'s No. 1 Southwest Settlement & Development Co., 1,450 ft. W of E line and 330 ft. S of N line of Sec. 226, H.&T. C. Sur. Rig up.

HARRIS COUNTY

American Liberty Oil Co.'s No. 1 Sweeney, Sec. 17, W.C.R.R. Sur. Drlg. shale 5,312 ft.

C. B. Bunte, Inc.'s No. 1 Laura Lackner, 6,400 ft. from E line, 194 ft. from S line of Henry Reinerman Sur., near NW city limits of Houston. Drlg. shale 4,400 ft.

C. C. Foster and others' No. 1 H. K. Johnson, 2,000 ft. from S line and center of E and W lines of G.C.&S.F. Sur. Drilled 25 ft. and S.D.

Farrell Bros. Co.'s No. 1 Brooks Est., 7,400 ft. S and W of NE cor. of R. & R. Vince Sur. Cmtd. csg. 412 ft.

W. U. Paul's No. 1 E. M. House, 2,300 ft. N and 1,000 ft. E of NE cor. of E. Benson Sur. in M. Masruder Sur. Drlg. shale 4,010 ft.

JEFFERSON COUNTY

Magnolia Pet. Co.'s No. 1 E. Herbert Trust, 990 ft. N, 330 ft. E of SW cor. of P. H. Bell Sur. No. 2. Reaming 3,100 ft.

Sun Oil Co.'s No. 1 H. Long, 1,500 ft. N line, 990 ft. E line of lease.
Drlg. shale 7,033 ft.

LIBERTY COUNTY

R. M. Bruner et al's No. 1 N. Bell, 150 ft. from N line and 150 ft. from W line of Bell's 187-ac. tract, H.&T.B. Sur. No. 4.
Rigging up.
Extension Oil Co.'s No. 1 J. A. Lovett, 300 ft. from E and 600 ft. from S line of lease, P. P. Deevers Sur.
S.D. 3,335 ft.
Liberty-Independent Oil Co.'s No. 1 J. M. Neal, 3,550 varas from E line and 500 varas from N line of Samuel Strong Sur.
Drlg. 3,000 ft.
A. L. Maxwell's No. 1 M. D. Hinecliff, 300 ft. from E line and 1,000 ft. from N line of H.&T.C. Sur. No. 150.
Location.
Thomas et al's No. 1-A Eicke, 460 ft. from W line and 2,350 ft. from S line of tract in Green Sur.
Preparing to drill deeper.
Turnbull and Irwin's No. 1 Lynott and Buffum, 466 ft. S and E of NW cor. of SE 100 acres of W 400 acres of 856-ac. tract, James Robeson Sur.
Coring 5,625 ft.

MATAGORDA COUNTY

Continental Oil Co.'s No. 1 Robbins, J. C. Franz Sur.
T.D. 6,995 ft.; getting ready to sidetrack at 6,630 ft.
Dr. Griffith's No. 1 fee, 3,000 ft. from N line and 3,000 ft. from W line of Wm. B. Bell Sur.
Rig up and S.D.

MONTGOMERY COUNTY

Brown & Wheeler et al's No. 1 Jones, 440 ft. out of NW cor. of S 175 acres of 350-ac. tract.
Location.

ORANGE COUNTY

Blue Line Oil Co.'s No. 1 Godwin, Richard Ballew Sur., 300 ft. from E line and 150 ft. from NE line of Godwin 20-ac. tract.
T.D. 3,956 ft.; moving in heavier rig.
Texas Louisiana Oil Co.'s No. 1 Starks, 2,450 ft. N of NW cor. M. Delano Sur. 63, 10,-500 ft. E at R/A.
T.D. 5,055 ft.; S.D.

POLK COUNTY

Howard Dailey et al's No. 1 Z. B. Knox, 1,450 ft. W and 1,920 ft. S of NE cor. of F. Chairs Sur., 1¼ mile NE of Corrigan.
S.D. 40 ft.
J. F. Anderson's No. 1 E. L. Duke (O.W.D. D.), 400 ft. from E and 350 ft. from S of SW cor. of P. Michelick 50-ac. lease, Abst. 56, P. J. Mineral Sur.
Waiting on a new mud pump; T. D. 5,-804 ft.
Johnson Bros.' No. 1 J. F. Smith, Isaac Parker Sur., 330 ft. from S and E lines from J. F. Smith's 55-ac. tract.
Abd. 4,240 ft.
Alpha Pet. Co.'s No. 1 Martha E. Roberts, 2,000 ft. W and 5,000 ft. S of most western SW cor. of P. A. Sublett Sur., J. F. DeRumayor Sur.
Abd. 5,641 ft.
Dick Schwab's No. 1 Lynch, 330 ft. out of NW cor. of 200-ac. tract in the George Jameson Sur.
Location.

REFUGIO COUNTY

Cecil Hagen et al's No. 1 Edith Clarkson, 1,736 ft. from N line, 3,820 ft. from E line of J. Coughlin Sur.
Location.
Heard-Holland Oil Co.'s No. 1 Peck, 366 ft. N and W out of NW and SW of Bonnie View Subd.
S.D. 5,348 ft.
Quintana Oil Co.'s No. 1-B O'Connor, 139 ft. E line and 2,525 ft. S line of B.B.B.&C. Sur., Abst. 96.
T.D. 6,800 ft.; P.B. to 5,800 ft.

VICTORIA COUNTY

Devonian Oil Co.'s No. 1 J. M. Fagan, Peter Teal League, Abst. 112, 9,000 ft. from N line, 466 ft. W of E line.
Rig up.
Texas Co.'s No. 1 J. B. Midgett, N 35 deg. W 1,000 ft. and S 55 deg. W 1,000 ft. from SE cor. of lease in T.&N.O. Sur., Sec. 14.
Comp.; T.D. 5,790 ft.; P.B. to 2,840 ft. and sidetracked; I.P. 1,560,000 ft. of gas per day; ¼-in. choke.

WALKER COUNTY

E. P. Kilgore et al's No. 1 Lamkin, 320 ft. from S line and 320 ft. from E line of Lamkin 1,000-acre tract in J. J. Holcomb Sur.
Location.

WHARTON COUNTY

Texas Gulf Prod. Co.'s No. 1 Kresta, 440 ft. N and E from SW cor. of tract in Sec. 84, W. B. Ivey Sur.
Drlg. 6,910 ft.

SOUTH LOUISIANA

ALLEN PARISH

Humble O. & R. Co.'s No. 1 Industrial Lumber Co., 1,320 ft. W line and 2,440 ft. S line Sec. 21-3s-5w.
Drlg. shale 7,346 ft.

ASCENSION PARISH

Humble O. & R. Co.'s No. 2 S. Gumbel & Co., 500 ft. southwesterly from No. 1, 275 ft. easterly from road and approx. 475 ft. N of S line of tract, Sec. 33-10s-2e.
Derrick.

BEAUREGARD PARISH

Gulf Ref. Co.'s No. 1 Lutcher Moore, 660 ft. from S line, 760 ft. from E line, NE Sec. 35-6s-12w.
Drlg. sandy shale 5,368 ft.
Richardson & Martin's No. 1 Southwest Lbr. Co., SW Sec. 6-5s-12w.
Location.

CALCASIEU PARISH

Fohs' No. 1 O. H. Castle, 330 ft. S and 330 ft. W of C Sec. 13-9s-8w.
Location.
Humble O. & R. Co.'s No. 1-B Industrial Lbr. Co., 466 ft. N, 1,399 ft. W of the SE cor. Sec. 27-8s-12w.
Rigging up.
Union Sulphur Co.'s No. 2 Barbe, 379 ft. S and 350 ft. W of NE cor of SE of Sec. 11-9s-3w.
Flowed 180 bbls. of net oil in 24 hrs.; through ¼-in. choke; tubing pressure 400 lbs.
Union Sulphur Oil Co.'s No. 1 State Land, 1,940 ft. S, 2,513 ft. E of NW cor. Sec. 12-9s-8w.
Drlg. shale 4,500 ft.
Wheeler Oil Co.'s No. 1 Gabbert, 1,322 ft. E and 648 ft. N of SW cor. of Sec. 28-9s-7w.
Drlg. clay 50 ft.

EAST FELICIANA PARISH

Thompson Creek Oil Co.'s No. 1 Fannie Noland, 2,600 ft. E and 1,580 ft. N of SW cor. Sec. 70.
Drlg. sand 825 ft.

EVANGELINE PARISH

Humble O. & R. Co.'s No. 1 Haas, 1,250 ft. SE of Bayou Nezpique, 466 ft. NE of SW line of Sec. 22-4s-1w.
Location.

CAMERON PARISH

Texas Co.'s No. 10-A State, 16,855 ft. W and 3,270 ft. N of NE cor. Sec. 1-14-9w in Twp. 13s-9w.
T.D. 6,270 ft.; sidetracked 4,109 ft.; drlg. 4,582 ft.
Texas Co.'s No. 1 Jessen, 1,170 ft. E and 550 ft. N of C Sec. 24-14s-10w.
Location.

LAFOURCHE PARISH

Barnsdall Oil Co.'s No. 3 Harang Plantation, S.D. 6,252 ft.
R. L. Gay, trustee's No. 1 Godchaux, 3,920 ft. N and 1,746 ft. E in common cor. of Lots 34 and 36, Twp. 15s-19e.
S.D. 6,226 ft.
Southern Sulphur Corp.'s No. 1 D. L. Lagraize, 800 ft. E of NW cor. of Lot 7, thence 350 ft. S of Sec. 26-21s-22e.
Spudded and S.D.

PLAQUEMINES PARISH

Texas Co.'s No. 13 State-Garden Island Bay, Sec. 107-33s-32e.
Set 21½-in. csg. at 102 ft.; drlg. shale 923 ft.
Venice Corp.'s No. 1 Burras.
Set 10-in. csg. at 1,533 ft.

RAPIDES PARISH

J. B. Evers' No. 1 G. Wettermark, 540 ft. S and 520 ft. E, NW cor. NE SW Sec. 35-4n-2e.
Location.
C. D. Loe's No. 1 Barrett, 330 ft. NW of SE line and 880 ft. NE of SW line of Sec. 40-5n-1w.
Rig up and S.D.

ST. BERNARD PARISH

Danciger's No. 1 Battles, 836 ft. N, 1,198 ft. W of SE cor. Sec. 135-14s-14e.
Drlg. hard shale 4,850 ft.

ST. LANDRY PARISH

Bailey Gaunce's No. 1 Lewis, 300 ft. N and E of SW cor. of NW of NE of Sec. 29-5s-6e (workover).
S.D. 5,043 ft.
H. J. Weir's No. 1 Declouet, Sec. 108-8s-5e, near Lafayette Parish line and 3 miles N of Anse La Bute Field.
Location.

ST. MARTIN PARISH

Texas Co.'s No. 6 St. Martin Land Co., 660 ft. S and 500 ft. W of NE cor. SE Sec. 17-8s-7.
Drlg. sand and lime 3,968 ft.

VERMILLION PARISH

Moore Bros.' No. 1 Brussard, 350 ft. S of N line, 250 ft. E of W line, NE cor. Sec. 32-11s-3e.
T.D. 4,056 ft.: fishing.

VERNON PARISH

Robert R. Williams, Sec. 3-1n-9w.
Rig up and S.D.

La.-Ark. Wildcats

(Continued from Page 152)

S and W, NE cor. Sec. 30-19-4e.
Set 6-in. at 2,143 ft.
United Public Service Co.'s No. 2 fee, 660 ft. S and W, NE cor. Sec. 26-19-3e.
Set 7-in. at 2,147 ft.

RED RIVER PARISH

Louis L. Glass' No. 1 Dickson, 400 ft. S and W, NE cor. SE Sec. 32-12-8.
S.D. 1,030 ft.
Circle W and Windsor Oil Co.'s No. 1 Jenkins Est., 660 ft. E and E, NE cor. NW Sec. 4-12-11.
Drlg. 2,575 ft.
C. M. Cope et al's No. 1 Thomas, 330 ft. S and E, C Sec. 34-13-3.
Testing 1,630 ft.

SABINE PARISH

H. J. Brothers et al's No. 1 Edwards, 300 ft. S and W, NE cor. SW NW Sec. 29-9-13.
Set 6-in. 1,552 ft.
R. B. Campbell et al's No. 1 Cook Land Co., 150 ft. N, 300 ft. W, SE cor. NW NW Sec. 36-10-12.
S.D. 1,880 ft.
Erle P. Halliburton's No. 3 Burkett, 330 ft. N and W, SE cor. SW SE Sec. 9-9-13.
Set 10-in. 40 ft.; set 8-in. 1,742 ft.
Halliburton & Meadows' No. 1 Jackson, 330 ft. S and E, NW cor. NE NE Sec. 15-9-13.
P.B. to 1,650 ft.
Helena Oil & Gas Co.'s No. 1-B Graham, 330 ft. S and W NE cor. NE NW Sec. 20-9-13.
Pumping S.W. 2,000 ft.
L. D. Higgins' No. 2 Burkett, 330 ft. S and E, NW cor. NE NE Sec. 16-9-13.
Set 10-in. 40 ft.; set 6-in. 1,503 ft.
Zan Lloyd's No. 1 Henderson, 330 ft. N and W, C Sec. 29-9-13.
W.O.S.R. 2,031 ft.
Dr. O. B. Hicks' No. 1 Neal, SE SW SE Sec. 18-9-12.
Set 10-in. 40 ft.

RAPIDES PARISH

Evars & Collingsworth's No. 1 Hickman, 330 ft. S and E, NW cor. Sec. 40-4-1e.
Dry and abd. 2,130 ft.
C. D. Loe, trustee's No. 1 Baird Est., SE cor. Sec. 40-5n-1w.
Rigging up.

UNION PARISH

Carbons Consolidated's No. 1 Lankford, 431 ft. N, 362 ft. E, SW cor. SE SE Sec. 3-21-3e.
Drlg. 2,090 ft.

WINN PARISH

Red River Ref. Co.'s No. 2 Tremont Lbr. Co., 320 ft. N, 521 ft. W, SE cor. Sec. 26-11-1w.
Set 10-in. 61 ft.; drlg. 625 ft.

ARKANSAS

ARKANSAS COUNTY

Grand Prairie Realty Co.'s No. 1 Fischer, 200 ft. S and E, NW cor. NE NW Sec. 6-6s-4w.
Rigging up.

COLUMBIA COUNTY

Dudney & Woodward's No. 1 Pearce, 330 ft. S and W, NE cor. NW Sec. 7-17-20.
Set 10-in. 132 ft.; S.D. 500 ft.

HEMPSTEAD COUNTY

Ark. Drlg. Co.'s No. 1 Jones, 1,000 ft. S, 600 ft. W, NE SE Sec. 11-14-24.
S.D.; clearing title 2,808 ft.
B. A. Austin's No. 1 McWilliams, 300 ft. N and W of SE cor. NW SW Sec. 19-13-23.
Drlg. 1,515 ft.
A. H. Bagnelle's No. 1 Trattner & Rhinehart, Sec. 2-13-26.
S.D. 1,992 ft.
F. W. Martin & Co.'s No. 1 Lafferty, 500 ft. N and W SE cor. NW Sec. 17-14-24.
Drlg. 2,906 ft.

LAFAYETTE COUNTY

Benedum & Trees' No. 2 Bodcaw, C SE SE NE Sec. 19-16-23.
Drlg. 2,665 ft.
Douglas Lawn's No. 1 Camp, 330 ft. S and W, NE cor. SW SE Sec. 14-15-23.
S.D. 2,910 ft.

MILLER COUNTY

Fitzwater et al's No. 1 Norson, SW cor. SE SW Sec. 20-15-27.
S.D. 3,177 ft.
Ark. Oil, Gas & Ref. Co.'s No. 1 Beck, SW cor. NW SW Sec. 34-15-26.
1,200 ft. oil in hole at 2,920 ft.
King Oil Corp.'s No. 1 C. H. Schroder, 200 ft. N, 330 ft. E, SW cor. SW NE Sec. 34-14-28.
S.D. 2,600 ft.
Magnolia Pet. Co.'s No. 5 Olivet, Sec. 3-16-26.
Drlg. 2,780 ft.
Oil Well Oil Corp.'s No. 1 Dodd, 300 ft. S, 200 ft. E, NW cor. SW NE Sec. 10-19-28.
Dry and abd. 3,810 ft.
Lee Timberlake's No. 1 Frost Est., 330 ft. N and E, SW cor. SW SE Sec. 27-15-26.
W.O. csg. 200 ft.

OUACHITA COUNTY

F. A. Book et al's No. 1 Arnold, Sec. 24-15-16.
S.D. 2,032 ft.
J. S. Carnes' No. 1 Scott, 150 ft. S and E, NW cor. SW NE Sec. 18-14-18.
S.W. and abd. 1,853 ft.
T. J. Gaughan's No. 1 Bragg, 330 ft. N and E, SW cor. NE SE.
Set 10-in. 104 ft.
J. D. Reynolds' No. 1 Guttry, 462 ft. S, 150 ft. W, NE cor. NE SW Sec. 21-15-19.
Testing 2,178 ft.
Sam M. Richardson & Co., Inc.'s No. 9 J. Goodwin, C NE SW Sec. 32-15-15.
W.O.S.R. 2,038 ft.

UNION COUNTY

Mrs. R. K. Jones et al's No. 1 J. Davis, 330 ft. N and W, SE cor. NW NW Sec. 28-16-14.
Setting 6⅝-in. 2,764 ft.
Lion Oil Ref. Co.'s No. 10-A Flenniken, 200 ft. N, 630 ft. E, C Sec. 10-16-15.
Set 5 3/16-in. at 2,396 ft.; T.D. 2,400 ft.
McCrselenn Oil Co.'s No. 1 Union Saw Mill Co., 330 ft. N and W, SE cor. NE NW Sec. 3-18-13.
P.B. from 3,577 ft.
Reuter Oil Co., Inc.'s No. 1 J. L. Kinard, 330 ft. S and E, NW cor. SE NW Sec. 32-18-14.
Testing 2,189 ft.
Short & Hayes' No. 1 Taylor, 450 ft. E, 330 ft. S, NW cor. NW SE Sec. 10-17-14.
Set 10-in. 147 ft.
Tubal Pet. Co.'s No. 1 Gaddy, 340 ft. N and E, SW cor. SE NW Sec. 14-17-14.
S.D.; W.O. 3,416 ft.

MISSISSIPPI

AMITE COUNTY

Mineral Resources, Inc.'s No. 1 Anderson, C NE NW Sec. 14-3n-3e.
S.D. 550 ft.

BOLIVER PARISH

White & Jones' No. 1 Ballou, SE SE NW Sec. 17-24n-7w.
Rigging up.

GREENE COUNTY

United Gas Pub. Service Co.'s No. 1 Greene County School Land, W½ W½ Sec. 16-1n-5w.
Rigging up.

JONES COUNTY

Snow-Black Pet. Co.'s No. 2 Watson, 520 ft. W, 200 ft. S, C Sec. 24-7n-13w.
D.S. stuck, 3,900 ft.

LAUDERDALE COUNTY

Bob Dalton's No. 1 Bounds, Sec. 34-7n-15e.
Set 10-in. 560 ft.; S.D.; W.O.

MONROE COUNTY

P. J. McAlpine's No. 1 Frank Rye, Sec. 15-15s-17w.
Drlg. 1,550 ft.
P. J. McAlpine's No. 1 Crook, 1,090 ft. S, 90 ft. W, NE cor. Sec. 15-13s-18w.
Reaming to set 8-in. at 520 ft.; T.D. 720 ft.

SIMPSON COUNTY

Berry Corp.'s No. 2 R. T. Berry, Sec. 32-2n-4e.
Set 7-in. 2,048 ft.

WALTHALL COUNTY

Mutual O. & G. Co.'s No. 1 Boyd, SW cor. SW SE Sec. 24-2n-9e.
Partly rigged up and S.D.

WARREN COUNTY

Orbet Drlg. Co.'s No. 1 R. L. Parker, 300 ft. E, CWL Sec. 14-14-1e.
S.D. 3,169 ft.

WASHINGTON COUNTY

Perkins & Dees' No. 1 Lee, 1,500 ft. E, 500 ft. N, SW cor. Sec. 33-18n-8w.
Set 10-in. 300 ft. and S.D. (corrected).

WINSTON COUNTY

Jack Vale et al's No. 1 Moody, 713 ft. N, 667 ft. E, SW cor. NW SW Sec. 3-13n-14e.
S.D. 20 ft.

La.-Ark. Proven Fields

NORTH LOUISIANA

CADDO—BLANCHARD

W. T. Boyd's No. 2 Mitchell, 1,975 ft. N, 1,600 ft. W, SE cor. Sec. 6-18-16.
Set 8-in. at 20 ft.; drlg. 940 ft.
Louana O. & G. Co.'s No. 4 Hammock, 650 ft. N, 2,830 ft. W, SE cor. Sec. 32-19-16.
Drlg. 997 ft.
M. Segall et al's No. 1 Sharpe, 330 ft. S and E, NW cor. Sec. 11-18-16.
Coring 915 ft.

CADDO—HOSSTON

Bayou State O. & G. Co.'s No. 1 Connell, 1,900 ft. N, 1,198 ft. E, SW cor. Sec. 15-21-14.
Abd.; will not pump at 964 ft.
C. G. Gibbon's No. 1 Burglass, 573 ft. N, 660 ft. W, SE cor. NE NE.
Comp., est. 3,000,000 ft. gas, 2,114 ft.
Shoreline Oil Corp.'s No. 44 Crystal, 220 ft. S and E of C Sec. 13-21-16.
Rigging up.
Shoreline Oil Corp.'s No. 3 Harrell, 250 ft. S, 220 ft. E, NW cor. SE SW Sec. 2-21-16.
W.O.S.R. 1,032 ft.

CADDO—RODESSA

United Gas Pub. Serv. Co.'s No. 1 Christian, 734 ft. N, 1,382 ft. W SE cor. Sec. 23-23-16.
Comp. 75,000,000 ft. gas, 5,833 ft.

SABINE PARISH—ZWOLLE

Alexander & Cane's No. 1 Fogman, SE cor. N½ SW NE Sec. 18-7-11.
Arranging set csg. 2,353 ft.
Ivan A. Allen's No. 1 La. Long Leaf, 330 ft. N and W, SE cor. NW SE Sec. 12-7-11.
S.D. for wtr., 2,120 ft.
Crichton & Co.'s No. 1 Williams, 660 ft. N and E, SW cor. SW SE Sec. 6-7-11.
Drlg. 1,750 ft.
Dyer et al's No. 1 McCollister, 330 ft. S and E, NW cor. SW NE Sec. 24-7-12.
S.D. 1,100 ft.
Foster & Hartman's No. 1 Bowman-Hicks, 330 ft. S and E, NW cor. NE Sec. 10-7-12.
S.D.; W.O. 2,696 ft.
E. D. Holcomb's No. 1 Porter, 330 ft. S, 330 ft. W, NE cor. SE Sec. 7-7-11.
W.O.S.R. 2,580 ft.
H. C. Maulding's No. 1 Davis, 350 ft. N and W, SE cor. NE NE Sec. 3-7-11.
Rigging up.
H. C. Maulding's No. 2 DeLatin, 330 ft. S and E, NW cor. NE SE Sec. 3-7-11.
S.D. 2,250 ft.
Pelican Nat. Gas Co.'s No. 35 La. Long Leaf, 330 ft. S and E, NW cor. NW NE Sec. 9-7-11.
Comp. pumping 175 bbls. at 2,649 ft.
Pelican Nat. Gas Co.'s No. 36 La. Long Leaf, 1,320 ft. N, 2,540 ft. E, SW cor. Sec. 9-7-11.
Set 10-in. at 60 ft.; drlg. 160 ft.
Pelican Nat. Gas Co.'s No. 14 Sabine Lbr. Co., 330 ft. N and W, SE cor. NE SW Sec. 11-7-12.
Tested dry; W.O. 2,642 ft.
K. C. Peterson et al's No. 1 Bowman-Hicks, 330 ft. S and E, NW cor. SW NW Sec. 2-7-9.
Rigging up.
Texas Co.'s No. 3 R. Mainer, 330 ft. N and W SE cor. Sec. 5-7-11.
Dry and abd. 2,800 ft.
Texas Co.'s No. 1 H. B. Wilson, 330 ft. S and W NE cor. SE SE Sec. 31-8-11.
Derrick.
Tex.-La.-Ark. Oil Co.'s No. 1 Pickering Lbr Co., Sec. 3-3-12.
S.D. 2,210 ft.

EAST TEXAS (BORDER COUNTIES)

CASS COUNTY

Eastern Texas Prod. Co.'s No. 1 Baker, Jesse Walling Sur.
Drlg. 3,983 ft.
R. K. Kamon et al's No. 1 Savage, Mary Patterson Sur.
S.D. 4,016 ft.

HARRISON COUNTY

R. C. Payne et al's No. 1 Lowery, E. D. Spain Sur.
P.B. to 3,524 ft.

PANOLA COUNTY

R. H. Davis' No. 1 Wooten Est., Winnie Mann Sur.
S.D. 2,092 ft.
Fagant & Saimon's No. 1 Colgin, Morton Noll Sur.
Set 6⅝-in. 2,364 ft.; tested S.W. and oil 2,400 ft.; O.W.D.D.
Givens & Holloway's No. 1 Wooten est., Winnie Mann Sur.
Drlg. 2,075 ft.
R. W. Price's No. 1 Crawford, J. A. Williams Sur.
Rigged up and S.D.
T. B. Smylie's No. 1 Henderson.
Bailing 2,385 ft.; O.W.D.D.
Fred Stovall Drlg. Co.'s No. 1 H. B. Ivey, P. Martin H.R.S.
S.D. 1,750 ft.

SHELBY COUNTY

Bush Oil Int.'s No. 1 Windham, W. M. Blackburn Sur.
S.D. 3,366 ft.
Cliff Stovall's No. 1 Pickering Lbr. Co., C. H. Patterson Sur.
S.D. 220 ft.
Turner & Neil's No. 1 Pickering Lbr. Co., P. W. Harvey Sur.
S.D. 250 ft.

ALABAMA

HOUSTON COUNTY

Rice O. & G. Co.'s No. 1 Oakley est., SE cor. NW SW Sec. 9-3n-29e.
Drlg. 2,580 ft.

LAMAR COUNTY

DeSoto O. & G. Corp.'s No. 1 Gardner, Sec. 22-15s-16w.
S.D. 4,182 ft.

Improved Tone and More Confidence Is Shown in Chicago Gasoline Market

By SPECIAL CORRESPONDENT

CHICAGO, Oct. 22.—The feeling of gloom which has long overhung petroleum markets here has given way to an improved tone so far as tank car gasoline market sentiment is concerned, for the present, even though it is recognized that the basic question of crude oil prices is still unsettled. Still, with the spot gasoline market looking a little better, trade attitude is necessarily a little more confident at the moment. Extremely low prices encountered in late September and early October have been replaced by mildly better ones.

Offerings of gasoline out of East Texas have dried up materially, with refiners in that region once again giving thought to the desirability of co-operating with the program committee's major company gasoline purchase plan. Reports reaching here about the conditions bearing on that situation are rather hopeful. In the meantime, carlot marketers are once more approaching refiners as buyers, whereas for weeks refiners have had to do the approaching to move their material.

Demand for Quality

Fairly good demand for antiknock and other special gasolines is reported. The question of margins is still another rather unsettled one, although early action is anticipated to solve this problem definitely for the central states district.

Kerosene

Kerosene has been quite slow, but reasonably steady, on a limited movement. Continued dry weather has had some effect on the amount of field work being done.

Heating Oils

Heating oils are dull and easy in the tank car market, with considerable price cutting reported in the retail market in Chicago and other large centers. Mild weather has prevented any fair test of the market situation, and low temperatures are expected to bring a considerable change in conditions. Potential demand is still considered to be quite heavy for the season. Local advertising campaigns and other considerations are making the heating oil people somewhat more optimistic.

Heavy Fuels

Lack of any good-scale industrial activity is still keeping the heavy fuels and gas oils in a depressed state. Prices are not much changed and the movement is quite limited. Sellers are watching steel and allied lines for signs of increased operating rates, but have been disappointed up to this time.

Lubricants

Lubricants present a mixed condition, with bright stocks and steam refined cylinder stocks easy, and neutrals reported rather strong and not very plentiful marketwise. Motor oil sales appear fairly good.

Naphthas

No change is reported in naphthas and solvents, with ruling prices marking time and the demand holding up fairly well.

Wax

Wax prices also are unchanged. Stocks appear to be increasing slightly, but current volume of business is fairly good.

Coke

Coke continues rather firm, sellers reporting good inquiry and favorable volume of current orders.

Crude Oil Prices

(Continued from Page 25)

Effective September 20 in Salt Flat by Shell Petroleum Corp.

Rocky Mountain States

Ilos, light (Sept. 29, 1933)	$.96
Ilos, heavy (Sept. 29, 1933)	.90
Florence, Colo. (June 17, 1933)	.80
Fort Collins and Wellington, Colo. (June 17)	(See Salt Creek prices)
Big Muddy (Sept. 29, 1933)	1.01
Frannie, light (May 1, 1934)	.70
Frannie, heavy (Sept. 29, 1933)	.62
Salt Creek and LaBarge (Sept. 9, 1933)	See Stanolind Mid-Continent price schedule
Grass Creek, light (Sept. 29, 1933)	1.18
Grass Creek, heavy (Dec. 15, 1932)	.45
Elk Basin (Sept. 29, 1933)	1.18
Rock Creek (Sept. 29, 1933)	1.02
Dutton Creek (July 8, 1933)	See Mid-Continent gravity prices
Lance Creek (Dec. 16, 1932)	.92
Poison Spider (Mar. 5, 1931)	.70
Hudson (June 2, 1931)	.65
Lander (Mar. 5, 1931)	.40
Rex Lake (Feb. 22, 1930)	1.10
Osage	1.08
Lost Soldier (Sept. 30, 1933)	.88
Hamilton Dome:	
Below 18° (July 1, 1934)	.52
18° and above (July 1, 1934)	.62
Torchlight (Sept. 29, 1933)	1.18
Greybull (Sept. 29, 1933)	1.18
Pondera	1.15
Sunburst (Sept. 29, 1933)	1.35
Cat Creek, Montana	1.07
Hogback (Sept. 29, 1933)	1.11
Lea County, N. Mex. (Sept. 29, 1933)	.75
Maljamar (Sept. 29, 1933)	.75
Artesia-Jackson (Dec. 1, 1933)*	.71

Note—Salt Creek, Torchlight, Elk Basin Grass Creek, Frannie, Greybull, Hogback and Ilos by Stanolind Oil & Gas Co. Elk Basin, Grass Creek light, Big Muddy, Rock Creek and Sunburst by Ohio Oil Co. Lost Soldier posted by Producers & Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Lea County, effective September 29, 1933, by Humble Oil & Refining Co. and other buyers; Fort Collins, Wellington, Orchard, Florence, Big Muddy, Cat Creek, Rattlesnake and Table Mesa by Continental Oil Co. Osage posted by Arro. Hamilton Dome, Wyo., by Stanolind Oil & Gas Co.

*Continental Oil Co.

North Louisiana and Arkansas

Smackover, Ark. (all grades)	$.70
Tullos, Urania, La. (Jan. 13, 1934)	.87
Nevada, Ark. (Sept. 29, 1933)	.68
East El Dorado (Sept. 29, 1933)	.70
Converse, La. (Mar. 17, 1934)	1.03
Elm Grove, La. (Sept. 29, 1933)	.75
Holly, La. (Nov. 17, 1934)	1.03
Pleasant Hill, La. (Mar. 17, 1934)	1.03
Zwolle, La (Mar. 17, 1934)	1.03
Champagnolle, Ark. (Mar. 17, 1934)	.81
Lisbon, Ark. (Mar. 17, 1934)	1.03
Stephens, Ark. (Sept. 29, 1933)	.70
Urbana, Ark. (Mar. 17, 1934)	.80
Other fields	(See gravity table)

Note—Smackover: Effective September 29 1933, Texas Co., Magnolia Petroleum Co. Standard of Louisiana, Louisiana Oil Refining Corp., Gulf Refining Co. and Phillips Petroleum Co. East El Dorado posted by Magnolia Petroleum Co. and Gulf Refining Co., Nevada by Standard Oil Co. of Louisiana, Urbana posted by H. L. Hunt, Inc., and Louisiana Oil Refining Co. Converse, Holly, Zwolle and Urbana by Standard Oil Co. of Louisiana; Elm Grove by Simmons Oil & Refining Co.; Pleasant Hill by Standard Oil Co. and Magnolia Petroleum Co. Champagnolle by Standard Oil Co. and Lion Oil & Refining Co.

Eastern States

TIDE WATER PIPE CO.
(Effective May 1, 1934)

Bradford, Pa.	$2.55
Allegheny, N. Y.	2.55

SOUTH PENN OIL CO.
(Effective May 1, 1934)

Pennsylvania Grade Oil in National Transit Lines (Bradford Field)	$2.55
Pennsylvania Grade Oil in Southwest Pennsylvania Lines	2.32
Pennsylvania Grade Oil in Eureka Pipe Line lines	2.17
Pennsylvania Grade Oil in Buckeye Pipe Line lines	2.07
Corning Grade Oil in Buckeye Pipe Line Co.'s lines (Oct. 2, 1933)	1.32

PENNZOIL CO.
(Effective May 1, 1934)

Pennsylvania Grade Oil in National Transit Lines:	
Group A	$2.47
Includes Cochran, Franklin, Hamilton and Doolittle districts.	
Group B	2.46
Includes Titusville district.	
Group C	2.45
Includes Turkey and Tidioute districts.	
Group D	2.44
Includes Bear Creek and Porkey districts.	
Group E	2.42
Includes Elcheneau, Bull Creek, Rough Run, Carbon, Dipner, Bredin, McJunkin, Jameson, Kennerdell, Emlenton, Tiona, Lacey and Kinzua districts.	

Price depends on length of pipe line haul to plant at Oil City.

PURE OIL CO.
(Effective May 1, 1934)

Cabin Creek, W. Va.	$2.17
Bradford Hollow, W. Va.	2.17
Kelly Creek, W. Va.	2.17

CREW-LEVICK CO.

Oil City-Titusville	$2.47

Middle Western States

OHIO OIL CO.
(Effective September 29, 1933)

Lima	$1.30
Illinois (Jan. 5, 1934)	1.13
Princeton, Ind. (Jan. 5, 1934)	1.13
Plymouth	Shut in
Western Kentucky (May 26, 1934)	1.01
Midland, Mich. (Sept. 30, 1933)*	1.01
Oceana, Mich. (Oct. 5, 1933)	.90
Somerset, Ky. (Sept. 30, 1933)	1.21

*Posted by Pure Oil Co. Producers Pipe Line Co. pays 5 cents per barrel over Pure Oil Co.'s posted price. Somerset, Ky., crude purchased by Ashland Refining Co., Ashland, Ky., and posted price includes premium. Oceana posted by Old Dutch Refining Co. and Naph-Sol Refining Co.

Canada

Ontario (September 9, 1933):

Petrolia*	$2.10
Oil Springs	2.17
Turner Valley (May 21, 1934):†	
Clear naphtha	$2.55
Discolored naphtha	2.37
Crude oil, 50 gravity	2.15
Crude oil, 45 to 49.9	2.07
Crude oil, 40 to 44.9	1.50

*Imperial Oil, Ltd. †Imperial Oil, Ltd., and Regal Oil & Refining Co.

Mexico

Panuco*	$0.90

*F.o.b. ship, based on August transactions and exclusive of production and export taxes and bar dues.

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Mid-Continent Field
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Index to Advertisers

A

Abercrombie, J. S., Co. .....
Air Reduction Sales Co. 73
Allegheny Steel Co. 164
Allis-Chalmers Manufacturing Co. ...139
Allsteel Products Mfg. Co., The 2
American Askania Corp. 163
American Cable Co. .....
American Iron & Machine Works Co.
American Meter Co. 4
American Recording Chart Co. 110
American Steel & Wire Co. .....
Apex Construction Co. 112
Associated Pipe Line Contractors ...112
Auer, C. L., and W. W. .....
Axelson Manufacturing Co. .....

B

Baker Oil Tools, Inc. 134
Barold Sales Co. 91
Barrett Co., The 99
Barret, William M., Inc. .....
Bethlehem Steel Co. 88-89
Boston Woven Hose & Rubber Co. ..
Bradford Motor Works, Inc. 176
Brewster Co., Inc. 147
Bridgeport Machine Co. 175
Broderick & Bascom Rope Co. 57
Brown Instrument Co., The 54
Byron Jackson Co. .....

C

Cameron Iron Works, Inc. .....
Carbolite Sales Co. 147
Caterpillar Tractor Co. 64
Chain Belt Co. .....
Champion Machine & Forging Co., The 32A
Chaplin-Fulton Mfg. Co., The 116
Chapman Valve Mfg. Co., The .....
Chemical Process Co., The .....
Chicago Bridge & Iron Works 61
Cities Service Oil Co. 63
Classified Advertising 175
Climax Molybdenum Co. .....
Continental Oil Co. .....
Continental Supply Co., The 32A
Cooper-Bessemer Corp., The 17
Crane Co. 3
Crutcher, Rolfs & Cummings 119
Curtin, W. H., & Co. 161

D

Darling Valve & Mfg. Co. 114
Dart, E. M., Mfg. Co. .....
Davis Regulator Co. .....
Dearborn Chemical Co. 94
Devine, J. P., Mfg. Co., Inc. .....
Doheny Stone Drill Co. .....
Dow Chemical Co., The 45
Dowell Incorporated 100
Dresser, S. R., Mfg. Co. 21
DuPont DeNemours & Co., Inc., E. I.

E

Eagle-Picher Lead Co. .....
Economy Electric Lantern Co. 160
Edward Valve & Mfg. Co., Inc., The 95
Elliott Core Drilling Co. 83
Emsco Derrick & Equipment Co. .....

F

First National Bank & Trust Co. of Tulsa, The 149
Fisher Governor Co. .....
Fluid Packed Pump Co. .....
Foster Wheeler Corp. .Inside Back Cover
Foxboro Co., The 137
Fredell Construction Co. 112
Frick-Reid Supply Corp. .....
Frisco Lines 176

G

Gardner-Denver Co. .....
Garlock Packing Co., The 127
Gaso Pump & Burner Mfg. Co. 109
Gasoline Products Co., Inc. 27
Gates Rubber Co. .....
Gearench Mfg. Co. 108
General Electric Co. 39
General Motors Truck Co. 6
General Paint Corp. 111
Gilbert & Barker Mfg. Co. .....
Goodyear Tire & Rubber Co., Inc. .. 15
Gott, H. P., Mfg. Co. .....
Grant Oil Tool Co. .....
Graver Tank & Mfg. Corp. 163
Greenspon's Son, Jos., Pipe Corp. 104
Guiberson Corp., The .....
Gulf Refining Co. .....

H

Halliburton Oil Well Cementing Co..
Hanlon-Buchanan, Inc. .....
Harrisburg Pipe & Pipe Bending Co.
Hazard Wire Rope Co. 67
Heeter, C. M., Sons Co. .....
Hercules Motors Corporation .....
Houston Oil Field Material Co., Inc..147
Hughes Tool Co. .....Back Cover
Humble Oil & Refining Co. .....
Hydril Co. .....

I

Illinois Steel Co. 69
International Harvester Co. of America 124
International Derrick & Equipment Co., The .....

J

Jarecki Manufacturing Co. 58
Jenkins Bros. 160
Jerguson Gage & Valve Co. .....
Johns-Manville Corp. .....
Jones & Laughlin Steel Corp. 31
Jones Co., The S. M. .....

K

Kellogg, M. W., Co., The .....
Kennedy Valve Mfg. Co., The 120

L

Landis Machine Co., Inc. .....
Lincoln Electric Co., The 42-43
Linde Air Products Co., The 50-51
Louisiana Supply Co. 147
Lucey Products Corp. .....
Ludlow Valve Mfg. Co., The .....
Lufkin Foundry & Machine Co. .....
Lummus Co., The .....
Lunkenheimer Co., The 132

Mc

McCord Radiator & Mfg. Co. 106
McEvoy, J. H., & Co. 147
McGee, Reece E. 112
McIntosh & Seymour Corp. .....

M

MacClatchie Manufacturing Co. 161
Macwhyte Co. .....
Magnolia Petroleum Co. .....
Maloney Tank Mfg. Co. ....Front Cover
Manhattan Rubber Mfg., Division of Raybestos-Manhattan, Inc. 77
Martin-Decker Corp. .....
Mason-Neilan Regulator Co. 158
Mepham Corp., Geo. S. .....
Merco Nordstrom Valve Co. .....
Miller, Max B., & Co., Inc. .....
Mission Mfg. Co. 147
Miller Sand Pump Co. .....
Missouri Pacific Lines .....
Mitchell Stewart Construction Co. ..112
Moore, Lee C., & Co., Inc. .....
Murray-Brooks Hdwe. Co., Ltd. 147
Muskogee Iron Works .....

N

National Bank of Tulsa .....
National Lead Co. .....
National Supply Co., The .....
National Tank Co. 135
National Transit Pump & Machine Co. .....
National Tube Co. 85
Nicholson & Co., W. H. .....
Norvell-Wilder Supply Co. 147
Nugent & Co., Wm. W. .....

O

Oil Center Tool Co., Inc. .....
Oil Conservation Engineering Co. .. 154
Oil Well Supply Co. .....
Oklahoma Gas & Electric Co. 93
O-K Machine & Mfg. Co. 31
Oxweld Acetylene Co. 50-51

P

Pacific Pump Works 150
Parkersburg Rig & Reel Co., The .. 86
Parsons Co., The Ralph M. 117
Penberthy Injector Co. .....
Petroleum Building 79
Petroleum Rectifying Co. of Calif. .. ..Inside Front Cover
Pittsburgh Steel Co. .....
Powell Co., The Wm. .....
Prest-O-Lite Co. 50-51
Pure Oil Co., The 133

R

Reed Roller Bit Co. .....
Reid, Joseph, Gas Engine Co. 143
Republic Rubber Co., The .....
Republic Steel Corp. (Upson Nut Division) .....
Republic Steel Corp. 48A-48B
Roebling's, John A., Sons Co. 157
Ruberoid Co., The 116
Rubloff & Co., Arthur 79
Ryerson & Son, Inc., Joseph T. .....

S

Security Engineering Co. .....
Sheehan Pipe Line Construction Co. 112
Shell Union Oil Corp. .....
Sinclair Refining Co. .....
Smooth-On Mfg. Co. 161
South Chester Tube Co. .....
Southern Alkali Corporation .....
Sperry-Sun Well Surveying Co. .....

T

Taubman Supply Corp. 171
Taylor Forge & Pipe Works 155
Taylor Instrument Companies .....
Texas Iron Works .....
Thermoid Rubber Co., The 53
Timken Roller Bearing Co. .....
Timken Steel & Tube Co. 144
Tracksen Co. .....
Tretolite Co. .....
Tube Turns, Inc. 123
Tulsa Camera Record Co. .....
Tulsa Chamber of Commerce 96
Tulsa Oil Thief Co. 111
Twin Disc Clutch Co. .....

U

Union Carbide & Carbon Co. 50-51
Union Carbide Sales Co. 50-51
Union Wire Rope Corp. .....
United States Rubber Co. 151
U. S. Steel Corp. Subsidiaries 69, 95
Universal Oil Products Co. 19

V

Vellumoid Co., The .....
Vogt, Henry, Machine Co. 128

W

Wailes Dove-Hermiston Corp. 103
Walworth Co. 1
Warren Petroleum Co. .....
Waukesha Motor Co. .....
Well Machinery & Supply Co. .....
Wheatley Brothers 110
Williams Bros. Construction Co. 112
Williams, C. K., Co. of Calif., Ltd. ..
Williams & Co., J. H. .....
Williamsport Wire Rope Co. .....
Wilson Supply Co. 143
W. K. M. Co., Inc. 147
Wyatt Metal & Boiler Works .....

Y

Youngstown Sheet & Tube Co., The 32B
Yowell Service Co., O. P. .....